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Abstract- The study investigated how financial institution financing played a role in the growth of small businesses in Nigeria. Researchers found family and personal savings as the main source of funding small businesses in Nigeria which makes it difficult for owners to secure long-term funding from financial institutions. Lack of long-term funding from a financial institution is one of the challenges that negate the growth of small businesses in Nigeria. The study revealed there is a relationship between financial institutions financing and growth of small business in Nigeria, and knowledge of how to secure the loan by managers is critical in securing long-term funding for small business growth. The study used Chi Square and found small business owners should employ experts who can process long-term loan and manage the loan for the growth of the business.


INTRODUCTION

Small business across the world employ the largest segment of countries workforce. Unemployment remains one of the gauges of measuring the growth and development of an economy. Thus, small businesses impacted hugely on the economy of the globe (Thomas, Adekunle, Olarenwaju, & Folarin, 2015). Like in developed economies, small businesses play a critical role in growing the economy of developing economies like that of Nigeria. The critical question facing the Nigerian economy is the recent plunge in the prices of oil in the international market which halts the economic growth, created unemployment, with an unprecedented level of inflation raging the economy. There are many calls for foreign direct investment in the Nigerian economy, and many factors bordering on security challenges that are facing the economy in the last six years and corruption is holding global firms to invest in the Nigerian economy. Government remains the large employer of skilled labor due to lowgrowth of large companies in the economy. Entrepreneurship remains the key that drives the growth of developed economies like U.S., with companies like Amazon starting from a garage and becoming the largest online shopping platform in the world (Simpson, 2016). The call for foreign direct investment into the Nigerian economy is for companies like Amazon to come and invest, and such companies started from small to a global firm. Small business is defined differently by many countries and scholars. Most of the definition of small business revolves around the number of employees they employed, while others define it along the line of start-up capital. The United States and Britain define small business according to the number of employees and profit they made (Gbandi & Amissah, 2014). Small and Medium Enterprises Development Agency of Nigeria (SMEDAN) defined Small business according to number of employees and cost of establishing the business. SMEDAN defined Small business enterprises as enterprises with total assets (excluding land and building) of 5 million Naira (USD 10,000,000) and employ 10 – 49 persons. While medium enterprises have total assets of between 50 million Naira (USD 100,000) and 500 million Naira ($1,000,000) and employ workforce between 50 – 199 employees (Ogunyomi & Bruning, 2015).

SMEs mostly sources their financing from personal savings and soft loans from family members (Dugguh, 2015). The Nigerian Government has been initiating programs like People’s Bank of Nigeria and National Economic Reconstruction Fund (NERFUND) aimed at subsidizing the cost of capital and increasing access to small businesses in the Nigerian economy (Dugguh, 2015). However, it is suggested that most of such initiatives not alter the situation of inadequate access to finance on the part of small businesses in the Nigerian economy (Dugguh, 2015). There exists mounting evidence that suggested small business across the world suffer from access to finance crisis (Carbo-Valvere, Rodrigues-Fenandez, & Udell, 2016). Trade credit remains a viable source of financing despite other sources of debt to small business. In U.S., SMEs that were financed with trade credit are about 31.3% of debt financing which is a little lower than 37.2% of bank loans (Carbo-Valvere et al., 2016). Trade credit in Nigeria can be harnessed to improve access to finance for SMEs, but the difficulty of repayment like other loans make risk higher (Udry, 1994).

Despite the availability of financial institutions across the length and breadth of Nigeria, it has been challenging for small businesses to secure a loan for growth which will impact positively in growing the economy through expansions that...
will trigger new employment windows. The paper aims at studying the relationship between small business growth and access to financing. The study is critical to trigger the growth of small businesses in the Nigerian economy to provide employment and revenue to the government.

STATEMENT OF THE PROBLEM.

Small businesses in Nigeria are said to be the catalyst for economic growth through the provision of employment, wealth creation, and innovation (SMEDAN, 2013). The rate of mortality of SMEs in Nigeria is staggering where most of them do not operate beyond their first five years. It was suggested that 80% of SMEs in the Nigerian economy does not operate beyond first five years (Obiwuru, Okwu, Akpa, & Nwankwere, 2012). SMEs in Nigeria provided 82% of the workforce of the economy, meaning 82% of Nigerian workers work for SMEs (SMEDAN, 2013). Six key areas were identified as the major challenges facing the SMEs in Nigeria as follows: low demand of products, poor infrastructure, lower profit, the widespread effect of corruption, lack of skills among managers, and inadequate access to finances (Opara, 2011). In a coordinated report between SMEDAN and National Bureau of Statistics Nigeria, use of obsolete equipment, multiple taxation, lack of access to the market, poor infrastructure, inadequate access to finance, inconsistent policies by government, and business development process are the challenges facing the SMEs in Nigerian economy (SMEDAN, 2013). Sourcing of financing continued to be the biggest problem facing the growth of SMEs in Nigeria (Ozioma-eeleoninmnuo, 2015). Most of SMEs are financed via informal sectors such as personal savings and family and cooperative loans (Terungwa, 2012). Research suggested that personal savings and credit suppliers are the most visible sources of financing SMEs in West Africa (Boateng & Abdulrahman, 2013). Thus, access to institutional debt financing remains the key challenge that is holding the growth of SMEs in Nigeria. The growth of SMEs in any economy including Nigerian remains one of the factors that will accelerate the country’s development (Dugguh, 2015). If SMEs thrive, Nigerian economy might grow by an increased rate of employment to citizens. Employment bolsters economic growth. SMEs propel innovation which in turn resulted in wealth creation and eventually earn foreign exchange to stabilize the Nigerian Forex market (Dugguh, 2015). The study will focus on managers and owners of SMEs to determine the relationship between business growth and access to institutional financing as against past studies that focus on the financial institution's constraints. The managers and owners of SMEs indicated how institutional financing help small businesses to grow, and whether knowledge of securing loans help small businesses to secure long-term funding? Thus, the study was to determine whether institutional financing is related to the growth of small business in Nigeria, and further indicated whether knowledge of institutional loan processing facilitated the accusation of loan-term funding by SMEs. The research will be helpful to owners and managers of SMEs to understand the impact of institutional financing in the growth of small businesses. It might also help owners of small businesses to understand the importance of knowledge of loan processing by their managers. The study will ensure improved SMEs growth which will spur Nigerian economic growth through the provision of new employment, generation of tax, and wealth creation.

LITERATURE REVIEW

Characteristics of Small Businesses

The United States and the United Kingdom defined small business based on the number of employees and returns on investment (Gbandi & Amiah, 2014). The diversity of nations resulted in multiple definitions for small business among nations. Small businesses are often defined based on the workforce, the amount of capital invested, and the management structure (Lucky & Olusegun, 2012). Small business definitions categorized SMEs in three forms, micro, small, and medium enterprises (Lucky & Olusegun, 2012). The small and medium scale enterprises development agency of Nigeria (SMEDAN) was initiated by the government of Nigeria to support the initiative of citizens on setting small businesses and their growth of in the economy (SMEDAN, 2013). According to SMEDAN, the small business consists of businesses that were initiated with 5 million Naira (US$10,000 as per parallel market exchange rate) and not exceeding 50 million Naira (US$100,000) employing 10 – 49 persons (Ogunyomi & Bruning, 2015). SMEDAN has defined medium scale enterprises in Nigeria as enterprises with employees from 50 to 199, and capital is ranging from 50 to 100 million Naira (US$100,000 to US$1,000,000) (Ogunyomi & Bruning, 2015). Nigerians regulatory body of monetary policies, the Central Bank of Nigeria (CBN) defined small businesses with capital ranging from 1.0 million Naira to 10.0 million Naira (US$2,000 to US$20,000) and employed fewer than 50 individuals (Juliana, 2013). The National Industrial Development Bank emphasized that small business is enterprises that its total cost does not exceed 750,000 Naira (US$1,500), while National Economic reconstruction fund defines SMEs as enterprises with an investment of equal or less than 10 million Naira (Juliana, 2013). Other institutions that attempted defining small businesses in Nigeria include Small and Medium Industries Equity Investment Scheme (SMIEIS) and define SMEs as those businesses with the total cost of between 1.5 million Naira and 200 million Naira, and having 10 - 300 individuals as a workforce (Lucky & Olusegun, 2012). The enterprise's promotion decree of 1989 categorized SMEs as businesses that provide the owner with employment in retail and mechanic businesses (Dugguh, 2015). The Nigerian industrial policy considers businesses with a total capital of between 100,000 and 2.0 million Naira as small businesses, and the Center for Management Development in Nigeria consider enterprises with total capital excluding land not exceeding 50,000 Naira and employing up to 50 persons as a small business (Dugguh, 2015). I adopted the definition of small businesses by SMEDAN because it focuses on two fundamental aspects of this study: capital and...
employees. SMEDAN (2013) stated small businesses are firms with capital of between 5 million Naira and 50 million Naira employing 1–49 persons. Thus, owners and managers of companies with capital of between 5–50 million Naira that employed 1–49 persons responded to the questionnaire of this study.

Research suggested that governments play a critical role in developing entrepreneurialism in an economy, because it drives economic growth, creates jobs, and increase the competitiveness of businesses (Thurik & Wennekers, 2004). The development of SMEs in Nigerian economy can be traced back to the pre-independence era which is characterized by economic turbulence immediately after the Nigerian independence from England in 1960 which witnessed citizens hit by poverty (Remi, Adegoke, & Opoola, 2010). The advent of entrepreneurship in Nigeria was also pre-independence, where citizens traded their excess farm produce by barter exchange system, and then, the agricultural sectors provide the country with 75% of its foreign exchange earnings (Oyelola, Ajiboshin, Raimi, Raheem, & Igwe, 2013). The discovery of oil in Nigeria become a neglect of the Agricultural sectors with country turning to oil as its source of income (Adeyemi & Abiodun, 2014). The country witnessed some development initiatives, but the dominance of government in economic activities, economic and political instability and delayed democratization failed the initiatives that are aimed to spur entrepreneurship in the economy (Adeyemi & Abiodun, 2014). Oyelola et al. (2013), suggested that lack of government interest in developing small businesses result in less development and success of SMEs. One of the critical functions of small businesses in an economy is the role in employing a significant segment of the workforce. Small businesses are the largest contributor of employments to the rural areas, where large firms are difficult to be found, and provide employment in all cadre and sector of labor, and provide employment to homemakers, old age people, students, skilled and unskilled persons (Malchow-Moller, Schjerning, & Sorensen, 2011). Failure of the small business results in loss of jobs and reduce revenue generated by local, state, and federal governments which may lead to failure of the government to develop the critical sectors of an economy (Malchow-Moller et al., 2011). Small businesses help economies to utilize savings that are mobilized domestically; such savings are effectively distributed equitably to help the growth of the economy (Juliana, 2013). Another important function of SMEs is the role played in mobilizing loans from the informal sector where idle money is channeled into useful economic activity (Juliana, 2013). Idle funds from friends, family members, local money lenders, cooperative for savings and credit societies, and personal funds are injected into economic activity that generates wealth through gainful employment (Juliana, 2013). For this study, a successful business is the one that makes a profit and employs people with wages that will add value to their survival.

Major challenges of Small Businesses

The critical challenge for small businesses regarding ownership structure particularly sole proprietors includes the lack of separation between the business funds and the funds that belong to the owner/s which is a factor that affects securing a loan from financial institutions (Ogbo & Nwachukwu, 2012). In most cases, partnership in small businesses do not work and often end up being managed by one of the partners (Ogbo & Nwachukwu, 2012). In a situation where owners of small businesses consider personal transactions within the funds of the firm, they eventually end up managing the business in their personal favors rather than the development of the businesses (Ogbo & Nwachukwu, 2012). In a situation where owners interfered with the funds of business, it makes it difficult to secure external funding which make growth and development also difficult and leads to eventual failure of the businesses (Ogbo & Nwachukwu, 2012). It is important to note that failure of small businesses to secure external funding results in their failure to survive beyond five years in business. Strategic planning in business is an indicator of a right way to success. A study suggested that formalized planning and extensive documentation does not benefit small businesses (Robinson Jrn & Pearce II, 1983). A study of 500 small firms in U. S. indicated that 50% of the firms that responded are successful without a written plan, and only 17.5% were successful with a completed business plan (Parks, Olson, & Bokor, 2015). Overdependence on imported raw materials or products has been the characteristics of small businesses in Nigeria (Du & Banwo, 2015). Over-reliance on imported raw materials and spare parts by small businesses play a crucial role in their low mortality rate (Du & Banwo, 2015). Other special features of small businesses are their incapacity to take a risk in new ventures which are related to their shortcomings of lack of capital and expertise and are mostly initiated as family businesses and manage by the family members with no expert employee (Gunasekaran, Rai, & Griffin, 2011).

One fundamental characteristic of small businesses is their role as the engine that stimulates innovation in an economy, creates jobs, and propels economic growth (Gale & Brown, 2013). The impact of small business in encouraging innovation in both developed and developing countries is glaringly evident, and innovation spur job creation through new jobs and the result of innovation ends up in a business growth and the country’s economic growth (Gale & Brown, 2013). Therefore, policy makers should face the challenge of inducing programs that will propel small businesses to introduce innovation in their business to enable harnessing of its role in creating new jobs, the growth of the business, and eventually the economic growth of the country. In Nigeria, the SMEDAN has the responsibility of stimulating innovation in small businesses (SMEDAN, 2013). Innovation will further create value by injecting new ideas into the system and finding new possibilities for the business. The survival of small businesses depends on its capacity to make innovation especially in the 21st-century business environment where competition continues to dictate survival (Bello & Ivanov, 2014). According to Peltier, Stoica, and Naidu (2012), small businesses must respond to innovation to enable them to compete in the 21st-century business environment. It was suggested that small businesses respond to competition
through innovation (Palmer & Griswold, 2011). Research indicated that, innovation in both families and non-family small business is a factor in business success, and that knowledge of innovation remains a key resource to sustainable competitive advantage in small firms (Price, Stoica, & Boncella, 2013). Three factors accelerate innovation in business, and they include the technology level of the enterprise, the effort of the enterprise in research and development, and systems of incentives (Manjon, Mompo, & Redoli, 2016). It was suggested by Fadahunsi (2012) businesses that have greater capability and resources in technological advances grow more than those firms that do not have. Gunasekaran et al. (2011) found small businesses can easily adapt to changes more than big firms because of their size is an advantage for flexibility. Therefore small businesses can improve their marketing, management, and organizational strategies to adopt new trends that will retain their competitive edge. Small businesses have to strategize their plan with a focus on innovation to compete in the business environment. Otherwise, failure is eminent due to the growing competition in the 21st-century business environment.

The major difference between small business owners and entrepreneurs is their goal, while small business owners strive to make an income that will sustain a family with little desire to grow large, an entrepreneur always works toward growth and profitability with the desire to grow large through innovation (Ionita, 2012). Small business owners usually strategize to provide an existing product or service to an existing market where competition is imminent, while entrepreneurs work toward providing new goods and service with new ideas into a market or create a new un-served market (Hurst & Pugsley, 2011). Most small business start-ups have no monetary benefits motive; small businesses are usually for the owner to be the boss, have a flexible schedule, or have a controlled working hour (Hurst & Pugsley, 2011). Considerations are made regarding training of new skills necessary for managers of small businesses to make a decision that will assist in making success (Hurst & Pugsley, 2011).

The critical success factors of small business include those factors that relate to entrepreneurship (owner), factors relating to the business, and factors relating to the environment in which a business operates (Lampadarios, 2016). Among the critical success factors relating to the environment, access to finance is key to the development of small businesses (Lampadarios, 2016). Dugguh (2015), suggested that competition, cost, ability to manage change, relationship with customers, growth, innovation, and challenges with accessing financing are the critical issues that are posing a threat to the survival of small businesses in Nigeria. According to SMEDAN (2013), the major challenges facing small businesses include the followings: poor infrastructure, access to finance, inconsistencies in government policies, poor business development services, access to the market, multiple taxations, and obsolete technology. Gumel (2013) categorized the critical challenges of small businesses into entrepreneurial, enterprise, and external business environmental factors challenges, but stressed the external business factors challenges are more severe in the Nigerian context. The external business factors challenges are mostly due to the inability of Nigerian Government to provide the enabling environment for small businesses to operate freely without crime and with access to infrastructure and finance (Gumel, 2017). A part from inadequate external institutional financing to small businesses, Gumel found less access to financing to small businesses as one of the major factors negating the success of small businesses in Nigeria. Therefore, small business financing remains a major pillar of the development of the small business sector of the Nigerian economy.

Small Business Finance

The capital to invest in small businesses is key to their growth, sustenance, and survival. In developing countries like Nigeria, small businesses suffer from the challenges of sourcing financing which ultimately affects their growth and development. Research conducted in Lagos Nigeria on 100 micro, small, and medium enterprises suggested that lack of funding is the barrier between SMEs and capital markets (Akinola & Iordoo, 2013). Research indicated that lack of financing deters small businesses to grow and become public limited companies. Ozioma-Eleodinmuo (2013), added that, indicated that sourcing of financing by SMEs in Nigeria negates their growth. Since Nigerian independence in 1960, the Nigerian government has been putting in place initiatives aimed at supporting the development of SMEs in the economy most of them focusing on supporting financing. One of the visible initiative by the Nigerian government and its partners was the National Economic Reconstruction Fund’s (NERFUND) efforts of supporting SMEs development participating commercial banks with loans for onward distribution to SMEs at lower interest rates. (Dugguh, 2015). The NERFUND’s initiative to SMEs was supported by the Nigerian government, the CBN, and African Development Bank (ADB) (Dugguh, 2015).

Another key concern about SMEs financing is undercapitalization. Undercapitalization of small businesses in Nigeria is attributed to tendencies of owners to depend on personal and family savings to kick start the businesses (Opara, 2011). Therefore, owners and managers of SMEs must look beyond their personal and family savings to realize their dreams of a new start-up small business to get the adequate capital that will make the business success. Inadequate records and reliable collateral by SMEs is one of the main reasons why financial institutions are adamant to provide financing to them (Opara, 2011). The debt financing options available to SMEs in Nigeria include Loans from commercial banks, loans from Microfinance banks, and loans from cooperative societies (Gbandi & Amissah, 2014). A quantitative study conducted in two North-Central States of Nassarawa and Benue, Nigeria suggested that SMEs are mostly financed by informal sources rather than formal financial institutions (Terungwa, 2012). Research that covers West Africa suggested that personal savings and credit supplies are the most visible sources of financing for SMEs (Boateng & Abdulrahman, 2013). Evidence from researchers suggested that lack of funding SMEs by financial institutions is key to...
the rate of failure of their businesses in emerging economies like Nigeria (Obokoh & Asaolu, 2012). Research by Franca (2013), involving 450 participants to determine how microcredit institutions influence the growth of SMEs in Nigeria suggested that there is a significant relationship between SMEs growth and microcredit institutions (Franca, 2013). It is also evident that SMEs avoid loan from microfinance institutions due to high interest rates which make it difficult for the SMEs to make a profit (Kanayo, Jumare, & Nancy, 2013). The financial institutions in Nigeria consider adequate and reliable collateral, an up-to-date financial record, healthy business, expert managers, and an excellent relationship with the business before they offer loans to SMEs (Zaraini & Zaima, 2013). In Nigeria, financial institutions are not ready to take the risk associated with giving loans to SMEs (Oliyide, 2012). The challenge facing Nigerian SME’s related to accessing financing from financial institutions is a key factor that affected their performances which are the reason why they do not adequately contribute to the economic growth and development of the country (Oliyide, 2012). The benefit of debt financing in business includes: business take advantage of debt financing to get tax benefits, businesses avoid financial distress, and businesses use debt ratios to run away from optimal target ratio (Modigliani & Miller, 1958). The importance of debt financing is as it relates to its benefits towards the growth of small business. The purpose of this study was to investigate the relationship between financial institutions funding and growth of small businesses in Nigeria. The study further found whether owners and managers knowledge of processing long-term loan helped small business to secure financial institutions loan.

EMPIRICAL STUDIES

The review suggested that low financing and lack of access to finance by SMEs particularly from financial institutions are major causes of failure of SMEs in Nigeria. It is also evident some of the challenges relating to accessing finance from financial institutions by SMEs is related to knowledge and skills of small business managers. The failure of owners and managers of small businesses to fulfill conditions set by financial institutions and lack of preparedness of both owners of SMEs and financial institutions to take risk relating to debt financing played a role in the inability of small businesses to access financial institutions loans. It was also highlighted that high rate of interest rates scares away owners of SMEs to seek to finance from formal institutions. The study aims to focus on the relationship between access to financial institutions financing and growth of SMEs in Nigeria. The factors relating to access to finance include the availability of the institutions and readiness of owners of SMEs to access finance from them and the growth of the firm. Factors in the review that are highlighted include the need to study further reasons why SMEs failed when trying to access finance from formal financial institutions.

CONCEPTUAL FRAMEWORK

The study was based on two frameworks of financing challenges of small businesses in Nigeria. The study aimed to focus on success factors of securing financing by small businesses. The small businesses access financial institutions financing for growth. Secondly, owners and managers should have the knowledge of securing financial institutions loans to be able to process institutional financing. The study will test the relationship between the basic frameworks identified. The two hypotheses were developed and analyzed from the framework and determine if access to financial institution financing is a tool for the growth of small businesses in Nigeria.

HYPOTHESIS

To study the relationship between financial institutions financing and small business growth in Nigeria, the following hypothesis was tested:

H1: There is a significant relationship between financial institutions financing and growth of small businesses.

H2: There is asignificantrelationship between knowledge of how to secure financial intuitions loans and growth of small businesses.

The method of testing the hypothesis is the contingency table analysis using the Chi-Square. The method determined the relationship between expected frequencies with the observed data.

METHODOLOGY

The method adopted was the use of survey method using the structured questionnaire as a survey instrument. The scope of the study was selected as Dutse City being the hub of business activities of Jigawa State, Nigeria. Fifty small businesses have been chosen in the areas of retail and wholesale, services, and light manufacturing. A probabilistic random sampling technique was used and selected the respondents from the managers and owners of the selected small businesses. Chi-square was used, tested and analyzed the data collected through a MegaStat statistical software package.

DATA ANALYSIS

Data was collected through structured questionnaires. 50 of the 50 copies of the questionnaires distributed was returned representing 100% response rate. Statistical percentage was used to analyze section A, while Chi-square ($X^2$) was deployed as tool for analysis of section B using the MegaStat Statistical software package for social sciences.

Hypothesis Testing:

The questionnaire was structured in the form of short answers meant to rate the acceptability of simple statements about the hypothesis. The degree of acceptance of statements of the respondents was used to test the hypothesis. The expected outcome of response was determined on the same basis the number of required response from each question. The observed response was used to test the hypothesis with expected response using Chi-square as a statistical tool. The
essence of the hypothesis test is to determine the significance or relevance of unknown statistical parameter set using a statement. The following steps were taken to test the hypothesis:

- List statistics was determined,
- The significance level was specified, and
- Data was used to make required analysis and decisions.

**Hypothesis Number One:**

H0: There is no significant relationship between Financial Institutions financing and growth of Small Businesses.
H1: There is a significant relationship between Financial Institutions financing and the growth of Small Businesses.

**Chi-Square Test:**

**Table 1: Financial Institutions Financing is Significant to the Growth of Small Businesses**

<table>
<thead>
<tr>
<th></th>
<th>Expected</th>
<th>Observed</th>
<th>Residual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree</td>
<td>25.0</td>
<td>10.0</td>
<td>-15.0</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>25.0</td>
<td>50</td>
<td>15.0</td>
</tr>
<tr>
<td>Total</td>
<td>25.0</td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

**Chi-Square** 18.000

<table>
<thead>
<tr>
<th></th>
<th>Df</th>
<th>Asymp. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>1.000</td>
</tr>
</tbody>
</table>

a. 0 cells (.0%) have expected frequencies less than 5. And 25.0 is the minimum cell frequency expected.

**Decision Rule:**

Based on the level of significance which is less than .05 as shown in the tables above, it indicates that there is nonconformity between the expected frequencies and the observed frequencies. Therefore, the null hypothesis stating there is no significant relationship between financial institutions financing and the growth of Small Businesses is rejected, while the alternate hypothesis stating that there is a significant relationship between financial institutions financing and the growth of Small Businesses is accepted.

**Hypothesis Number Two:**

H0: There is no relevance between knowledge of securing Financial Institutions loans and achievement of goals of small businesses.
H1: There is relevance between knowledge of securing financial institutions loans and achievement of goals of small businesses.

**Table 3: Knowledge of how to Secure Financial Institutions loans help small businesses to achieve their Goals and Funding Objectives.**

<table>
<thead>
<tr>
<th></th>
<th>Expected</th>
<th>Observed</th>
<th>Residual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly Agree</td>
<td>25.0</td>
<td>25.0</td>
<td>.0</td>
</tr>
<tr>
<td>Disagree</td>
<td>25.0</td>
<td>25.0</td>
<td>.0</td>
</tr>
<tr>
<td>Total</td>
<td>25.0</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

**Chi-Square** .000

<table>
<thead>
<tr>
<th></th>
<th>Df</th>
<th>Asymp. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>1.000</td>
</tr>
</tbody>
</table>

a. 0 cells (.0%) have expected frequencies less than 5. And 25.0 is the minimum cell frequency expected.

**Table 4: Employing Experts with Knowledge of how to Secure Financial Institutions Loans Will Guarantee the Expansion Financing of Small Businesses.**

<table>
<thead>
<tr>
<th></th>
<th>Funding Negates the Growth of Small Business</th>
</tr>
</thead>
</table>
| Chi-Square | 39.120
| Df        | 3                                           |
| Asymp. Sig.| .000                                        |

a. 0 cells (.0%) have expected frequencies less than 5. And 25.0 is the minimum cell frequency expected.
FINDINGS

The paper found financial institution financing is a tool for the growth of the small business sector of the Nigerian economy, and the owners and managers knowledge of how to secure financial institutions loans is relevance to securing the loan by small businesses. It was also discovered that, owners of the small business that employed managers who are expert in the process of securing financial institutions loan achieve their financing goals more than those that do not have experts managing their loan management processes.

DISCUSSIONS

As highlighted by some researchers, small businesses in Nigeria are mostly financed through personal savings and loans from informal sources such as families, friends, and cooperative associations. It was discovered that the mortality rate of small businesses in Nigeria is high to the extent that 80% are out of businesses within the first five years (Adebisi & Gbegi, 2013). The findings of this study aligned with lack of financing from formal financial institutions resulted in the failure of most small businesses in Nigeria (Obokoh & Asaolu, 2012). The analysis of data shows a positive relationship between access to financial institutions loans by small businesses and their growth. The study also confirmed with the research of Akinola and Iordoo (2013) which found lack of funding is the barrier of small businesses to capital markets in Nigeria. Similarly, lack of small business funding in Nigeria negates their opportunity to grow and become public liability firms. If small businesses can access financing from formal financial institutions in Nigeria, the tendency that they will grow and be quoted as public companies are high if such financing is strategically applied to innovative businesses.

Gbandi and Amissah (2014) also found the failure of small businesses in Nigeria is largely attributed to their inability to secure long-term debt that will grow the business, which aligned with the findings of this study. Another study found that, among the external factors that hinder small business (Bah & Fang, 2015). It was also discovered undercapitalization of Nigerian small businesses is attributed to the owners’ tendencies to the use of family and personal savings than sourcing institutional funding, which conform with the findings of the study (Opara, 2011).

Small business owners and managers are discouraged to apply for a loan from a financial institute because of administrative frustrations involved in the loan application procedures (Cole & Sokolyk, 2016). According to Cole and Sokolyk (2016), one-third of the discouraged firms would have secured the loan if they applied because of the potentiality of the business. The findings of Cole and Sokolyk conformed with the conclusions of the study that owners of small businesses that employed experts with knowledge of how to secure financial institutions loan help small businesses to secure long-term institutional funding that grows their business. Similarly, it aligned with the finding growth of SMEs in Nigeria is positively related to their ability to secure microcredit institutional funding (Franca, 2013). A study by Oliyide (2012) discovered financial institutions in Nigeria does not associate with risk involving SMEs loans, while Opara (2011) stated that SMEs inadequate collateral and bad records are the reasons why financial institutions avoided SMEs loan applications. High interest rate is one of the factors that prevent SMEs from applying for financial institutions loans (Franca, 2013). Notwithstanding risk, unreliable collateral, and poor records that discourage financial institutions to grant loans to SMEs, Terungwa (2012) found SMEs with proper risk management strategies secure loans from financial institutions. Therefore, the findings of this paper that employing experts with knowledge of how to secure financial institutions loans will help small businesses to secure institutional loans aligned with the findings of Terungwa that proper risk management strategies secure loans financial institutions loans for SMEs. Data collected is mostly from educated managers and owners of small businesses. Therefore, small business managers provided information on employees that help them secure financial institutions loan. Thus, SMEs should employ managers that are educated, experienced, and have skills on how to securean institutional financial loan to secure funding that will sustain their operations beyond five years.

<table>
<thead>
<tr>
<th>Disagree</th>
<th>Expected No.</th>
<th>Observed No.</th>
<th>Residual</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12.5</td>
<td>6</td>
<td>-6.5</td>
</tr>
<tr>
<td>Undecided</td>
<td>12.5</td>
<td>30</td>
<td>17.5</td>
</tr>
<tr>
<td>Agree</td>
<td>50</td>
<td>13</td>
<td>.5</td>
</tr>
<tr>
<td>Strongly Agree</td>
<td>12.5</td>
<td>50</td>
<td>-11.5</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Chi-Square</th>
<th>Asymp. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>38.480e</td>
<td>.000</td>
</tr>
</tbody>
</table>

a. 0 cells (.0%) expected frequencies less than 5. And 12.5 is the minimum cell frequency expected.

Decision Rule:

The asymptotic significance which is less than 0.05 level significance resulted in observed frequencies not in conformity with the expected frequencies. Therefore, the null hypothesis which stated that there is no relevance between knowledge of securing financial institutions loans and achievement of goals of small businesses is rejected while the alternate hypothesis that there is relevance between knowledge of securing financial institutions loans and achievement of goals of small businesses is accepted.
The findings of this paper will enable small business owners and managers to understand the importance of financial institutions funding in growing the business to achieve its goals and objective. The paper also indicated the importance of employing experts with knowledge of how to secure loans in small business to enable them to secure long-term funding and grow the business to become public liability companies. Researchers will find this paper useful in determining areas to expand their research on the problems small businesses are facing regarding access to financial institution financing.

RECOMMENDATIONS

The following are recommendations for deduction from the findings of the study:

1. Small business owners should not limit their financing to family and personal savings. They should source additional funding to grow their business from financial institutions.
2. Small business owners should employ persons that will keep proper records to enable lenders to assess their potentiality when they apply for institutional financing.
3. Small business owners should employ experts with knowledge of securing long-term loans, and loan management to help secure loans and manage the loan successfully.
4. Small business development agencies should train managers on loan application procedures and enlighten them the benefits of institutional loans to their businesses.
5. The government should find away to bring down the high interest rate of small business loans to facilitate their growth to enable employing more citizens of Nigeria by the sector.

The followings are recommendations for future research.

1. A study of why small businesses are avoiding financial institutions loans should be carried out by SMEDAN to enable them to understand different reasons as it applies to different demographics of the Nigerian economy.
2. The study should be carried by the financial institutions’ regulatory authority particularly on the Loan packages that can easily be assessed by small businesses and those that can be repaid easily to boost the growth of the sector.
3. A study should be made by SMEDAN researchers on how best to assist small businesses to access institutional financing.

CONCLUSION

Small businesses in Nigeria are faced with numerous challenges ranging from entrepreneurial, enterprise, and external factors challenges. Among the many challenges identified by researchers, most of them are external factor challenges. The growth of small businesses will provide the Nigerian economy with the necessary impetus that will reduce the level of unemployment in the country. The growth can be achieved if small businesses can access long-term financing to innovate and be relevant in the 21st-century competitive business environment. The study found financial institutions financing is one of the long-term sources of financing that grows small businesses in Nigeria and Experts employed by owners played a role in securing the loan for small businesses.

REFERENCES


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Synthesis and characterization of Schiff base complexes of Cu(II), Ni(II), Co(II) complexes of Schiff base derived from furan 3- carboxaldehyde and 3- amino pyridine

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Abstract- The Schiff base ligand, derived from furan 3- carboxaldehyde and 3- amino pyridine and the Cu(II), Co(II) and Ni(II) complexes were synthesized. The synthesized ligand and its complexes were characterized by elemental analysis, molar conductance, magnetic moment, $^1$H NMR, IR, UV-Vis and SEM. The analytical data shows that the metal to ligand ratio is 1:2. The molar conductance data revealed that all the complexes are non-electrolytes. Antimicrobial studies indicated that the complexes exhibit more activity than the ligand.

Index Terms- Keywords: $^1$H NMR, IR, Schiff base ligand, SEM, UV-Vis

I. INTRODUCTION

Schiff bases are an important class of ligands in coordination chemistry and find extensive application [1-3]. Schiff bases have played an important role as chelating ligands for a large variety of metal ions. In recent years, there has been enhanced interest in the synthesis and characterization of transition metal complexes containing Schiff bases as ligands due to their importance as catalysts in many reactions [4-9]. Also Schiff base complexes derived from heterocyclic compounds have acquired more attention in the field of bioinorganic chemistry because of their biological activities. Some heterocyclic-ketone derived Schiff bases show antibacterial activity and some others can act as antibacterial agent [10-13]. The present investigation deals with synthesis and characterization of complexes of Cu(II), Ni(II) and Co(II) by Schiff base ligand (L) derived from furan 3 carbomaldehyde and 3- amino pyridine using various techniques.

2. MATERIALS AND METHODS

2.1 Chemicals

GR/AR grade quality chemicals obtained from Merck chemicals were used. All the solvent used were purified by standard methods [14]. The micro analytical data (C, H, N) were collected using Perkin Elmer 2400 instrument. IR spectra were obtained using Schimadzu FTIR 470 IR spectrophotometer. $^1$H NMR spectrum was obtained using Brucker Advance 111,400 MHz spectrometer. Conductance measurements were obtained using systronics-305 conductivity meter. Electronic spectra of the ligands and its complexes were obtained using Schimadzu 1601, UV-Visible spectrometer. Powder XRD of complexes were recorded using Brucker AXS DS advance instrument.

2.2 Synthesis of Schiff base ligand

The ligand is prepared by taking equimolar ratio of furan-3-carboxaldehyde and 3-amino pyridine, which are dissolved in ethanol. It is then refluxed for one hour and reaction product is poured into ice. Yellow precipitate formed is filtered and washed with water.

2.3 Preparation of Schiff base metal complexes

The metal complexes were prepared by adding aqueous solution of Cu(II) nitrate, Ni(II) nitrate and Co(II) nitrate to the ligand in ethanol in 1:2 molar ratios and refluxed for about twelve hours at 80°C. The precipitated solids were washed with ethanol, diethyl ether and hot water and finally dried under vacuum at 90°C [15-18].

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3. RESULTS AND DISCUSSION

All the metal complexes are coloured solids, stable towards air and have high melting points. The complexes are insoluble in water and common organic solvents but soluble in DMF and DMSO.

3.1 Elemental Analysis

The analytical data suggested that all the complexes are mononuclear with the ligand coordinated to the central metal atom. The metal to ligand ratio in all complexes was 1:2\textsuperscript{[19,20]}. The details are given in Table 1.

<table>
<thead>
<tr>
<th>Compound</th>
<th>Yield%</th>
<th>Colour</th>
<th>Mol. Formula</th>
<th>Mol. Wt.</th>
<th>Elemental Analysis</th>
<th>Found (Calcd) %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ligand(L)</td>
<td>60</td>
<td>Brown</td>
<td>C\textsubscript{10}H\textsubscript{8}ON\textsubscript{2}</td>
<td>172</td>
<td>C</td>
<td>69.76 (69.71)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>H</td>
<td>4.65 (4.63)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N</td>
<td>16.27 (16.25)</td>
</tr>
<tr>
<td>[CuL\textsubscript{2}(NO\textsubscript{3})\textsubscript{2}]</td>
<td>57</td>
<td>Light green</td>
<td>C\textsubscript{20}H\textsubscript{16}O\textsubscript{8}N\textsubscript{6}Cu</td>
<td>531.55</td>
<td>C</td>
<td>45.15 (45.11)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>H</td>
<td>3.01 (2.99)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N</td>
<td>10.53 (10.51)</td>
</tr>
<tr>
<td>[CoL\textsubscript{2}(NO\textsubscript{3})\textsubscript{2}]</td>
<td>59</td>
<td>Brown</td>
<td>C\textsubscript{20}H\textsubscript{16}O\textsubscript{8}N\textsubscript{6}Co</td>
<td>526.94</td>
<td>C</td>
<td>45.54 (45.52)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>H</td>
<td>3.03 (3.01)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N</td>
<td>10.62 (10.60)</td>
</tr>
<tr>
<td>[NiL\textsubscript{2}(NO\textsubscript{3})\textsubscript{2}]</td>
<td>55</td>
<td>Brown</td>
<td>C\textsubscript{20}H\textsubscript{16}O\textsubscript{8}N\textsubscript{6}Ni</td>
<td>526.7</td>
<td>C</td>
<td>45.56 (45.53)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>H</td>
<td>8.75 (8.74)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>N</td>
<td>10.63 (10.61)</td>
</tr>
</tbody>
</table>

3.2 Molar Conductivity

The observed molar conductance data in 10\textsuperscript{-3} M DMF indicate non-electrolytic nature of complexes because their conductivity values were in the range 15-22 ohm\textsuperscript{-1} cm\textsuperscript{2} mol\textsuperscript{-1} (Table 2), thus all the complexes are non electrolytes. But the conductivity values were slightly higher than for non-electrolytes. This may be due to the partial solvolysis of the complexes in DMF medium\textsuperscript{[21]}. 

<table>
<thead>
<tr>
<th>Compound</th>
<th>Molar conductance (Ohm\textsuperscript{-1} cm\textsuperscript{2} mol\textsuperscript{-1})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ligand(L)</td>
<td>C\textsubscript{10}H\textsubscript{8}ON\textsubscript{2}</td>
</tr>
<tr>
<td>[CuL\textsubscript{2}(NO\textsubscript{3})\textsubscript{2}]</td>
<td>17</td>
</tr>
<tr>
<td>[CoL\textsubscript{2}(NO\textsubscript{3})\textsubscript{2}]</td>
<td>16</td>
</tr>
<tr>
<td>[NiL\textsubscript{2}(NO\textsubscript{3})\textsubscript{2}]</td>
<td>15</td>
</tr>
</tbody>
</table>

3.3. IR Spectra

The IR Spectrum provides the valuable information regarding the nature of functional groups coordinated to the metal atom. The selected IR spectral data of the ligand and complexes given in Table-3. The IR spectra of the ligand showed a broad band in the region 3347 cm\textsuperscript{-1} - 3213 cm\textsuperscript{-1} due to N-H stretching of amine. The absorption band at 1623 cm\textsuperscript{-1} \textsuperscript{[22]} can be assigned to C=N stretching. In all the complexes this bond is shifted to lower frequencies in the range 1638 cm\textsuperscript{-1} – 1622 cm\textsuperscript{-1} on complexation with metal, which can be attributed to coordination to imine nitrogen to metal centre. The bands in the region 1990-2200 cm\textsuperscript{-1} is due to C- H stretching. The bands in the region 745 cm\textsuperscript{-1} - 707 cm\textsuperscript{-1} is due to M-O stretching frequency. Absorption peaks in the region 1567 cm\textsuperscript{-1} -1549 cm\textsuperscript{-1} of complexes is due to C-NO\textsubscript{2} stretching frequency.
Table 3. Selected FT IR frequencies (cm$^{-1}$) of the ligand and complexes

<table>
<thead>
<tr>
<th>Ligand/Complex</th>
<th>$\nu_{\text{N-H}}$</th>
<th>$\nu_{\text{C=N}}$</th>
<th>$\nu_{\text{C-N}}$</th>
<th>$\nu_{\text{C-H}}$</th>
<th>$\nu_{\text{M-N}}$</th>
<th>$\nu_{\text{C-NO}_2}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ligand(L) C$_{10}$H$_8$ON$_2$</td>
<td>3347</td>
<td>1344</td>
<td>1623</td>
<td>2114</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>[Ni L$_2$(NO$_3$)$_2$]</td>
<td>3213</td>
<td>1344</td>
<td>1567</td>
<td>2108</td>
<td>707</td>
<td>1567</td>
</tr>
<tr>
<td>[Co L$_2$(NO$_3$)$_2$]</td>
<td>3100</td>
<td>1344</td>
<td>1706</td>
<td>2150</td>
<td>752</td>
<td>1552</td>
</tr>
<tr>
<td>[Cu L$_2$(NO$_3$)$_2$]</td>
<td>3200</td>
<td>1365</td>
<td>1622</td>
<td>2105</td>
<td>708</td>
<td>1549</td>
</tr>
</tbody>
</table>

Fig: 1 - FTIR Spectrum of Schiff base ligand (L)

Fig. 2 FTIR spectrum of Ni(II) complex
3.4. UV visible spectra

The absorption region assignment and geometry of the ligand and complexes are given in Table 5. The ligand showed a broad band at 330 nm which is assigned to \(n-\pi^*\) transition of the C=N chromophore. On complexation this bond was shifted to the lower wave length suggesting the coordination of imine nitrogen with central metal ion \([23]\). The UV spectra of the Cu(II) complexes showed three absorption bands at 321 nm, 308 nm and 263 nm giving a hexahedral coordination. The UV spectra of Co(II) and Ni(II) complexes showed absorption bands at 228 nm, 220 nm and 278 nm, 287 nm and 264 nm respectively suggesting octahedral coordination for the complexes.
Table 5 UV-Visible Spectra of the ligand (L) and complexes

<table>
<thead>
<tr>
<th>Ligand/ Complex</th>
<th>$\lambda_{max}$ (nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ligand (L)</td>
<td>215 210 207</td>
</tr>
<tr>
<td>C$_{10}$H$_8$ON$_2$</td>
<td></td>
</tr>
<tr>
<td>[Cu L$_2$(NO$_3$)$_2$]</td>
<td>228 220 -</td>
</tr>
<tr>
<td>[Co L$_2$(NO$_3$)$_2$]</td>
<td>278 287 264</td>
</tr>
<tr>
<td>[Ni L$_2$(NO$_3$)$_2$]</td>
<td>321 308 263</td>
</tr>
</tbody>
</table>

Fig.6 UV visible Spectrum of ligand (L)

Fig.7 UV visible spectrum of Cu(II) complex
3.5 Magnetic Susceptibility Measurements (BM)

The magnetic susceptibility values of the complexes are shown in Table 6.

<table>
<thead>
<tr>
<th>Ligand/ Complex</th>
<th>Magnetic Susceptibility (BM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Cu L₂(NO₃)₂]</td>
<td>1.82</td>
</tr>
<tr>
<td>[Co L₂(NO₃)₂]</td>
<td>2.54</td>
</tr>
<tr>
<td>[Ni L₂(NO₃)₂]</td>
<td>3.1</td>
</tr>
</tbody>
</table>

The Cu(II) complex exhibited magnetic moment of 1.82 BM indicating greater distorted octahedral geometry of the complex. Co(II) complex had magnetic moment of 2.54BM indicated the high spin nature of the complex and have octahedral geometry. The Ni(II) complex exhibited the magnetic moment value of 3.1 BM indicated octahedral coordination.

3.6 ¹H NMR Spectra

The ¹H NMR Spectra of the ligand shows a peak at δ = 9.81ppm is accommodate to the azomethine proton of the CH=N group. Peaks around δ = 6.7 – 7.59 ppm shows to presents aromatic ring proton. The peak at δ =1.9 -1.06ppm is due to the proton at the furan ring. ¹H NMR Spectra of the ligand is shown in Fig.9

On complexation a signal appears due to the proton attached to azomethine group at δ = 9.89 ppm. This field shift indicates the deshielding of azomethine proton coordination through the nitrogen atom of the azomethine group.
Based on the above results the proposed structure of Ligand (L) and its metal complexes is given below,

![Fig.9 ¹H NMR Spectra of ligand](image)

3.7 SEM Analysis
The surface morphology of the complexes has been examined using scanning electron microscope. The SEM images of Cu(II) complex is given below. The SEM images showed that all the complexes are micro crystalline in nature, with rough
and pity surface. Careful examination of the single crystal, clearly indicated the nanoscale size of the single crystal of the complexes [16].

3.9. Antibacterial activity

Schiff base complexes of transition metals play vital role in biological study; some of these have now been widely studied for their antimicrobial and anticancer properties [24,25] and extensive investigations in the field of metal complexes have been reported [26,27].

The present investigation suggests that all the metal complexes of the ligand bearing metal ion, phenolic moiety, benzene ring, -N=CH- group have comparatively more biological activity [28]. This study serves as a basis for the chemical modifications directed towards the development of new class of antibacterial agents. Antibacterial activities of the ligand, complexes and standard drugs were screened by disc diffusion method in DMSO as solvent. The results of antibacterial study are given in Table-7. The antibacterial activity was estimated based on the size of inhibition zone in the discs. Under identical conditions the Schiff base complexes of Cu(II) is found to be more active, others exhibit moderate activity.

Table.7 Antibacterial activity data of ligand and its complexes.

<table>
<thead>
<tr>
<th>Ligand/Complex</th>
<th>S. aureus</th>
<th>Styphi</th>
<th>Vcholera</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ligand(L) C₁₀H₈O₂N₂</td>
<td>6mm</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>[Ni L₂(NO₃)₂]</td>
<td>6mm</td>
<td>7mm</td>
<td>6mm</td>
</tr>
<tr>
<td>[Co L₂(NO₃)₂]</td>
<td>9mm</td>
<td>8mm</td>
<td>9mm</td>
</tr>
<tr>
<td>[Cu L₂(NO₃)₂]</td>
<td>18mm</td>
<td>14mm</td>
<td>15mm</td>
</tr>
<tr>
<td>Positive</td>
<td>30mm</td>
<td>25mm</td>
<td>26mm</td>
</tr>
</tbody>
</table>

3.10 Antifungal activity
The results of antifungal studies reveal that both ligands and complexes do not show anti-fungal properties [29]. The data are given in Table 8.

### Table 8: Antifungal activity data of ligand and its complexes.

<table>
<thead>
<tr>
<th>Ligand/Complex</th>
<th>Candida albicans</th>
<th>Aspergillus niger</th>
<th>Candida humilis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ligand(L)</td>
<td>C_{10}H_{8}ON_{2}</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>[Ni L_{2}(NO_{3})_{2}]</td>
<td>-</td>
<td>-</td>
<td>--</td>
</tr>
<tr>
<td>[Co L_{2}(NO_{3})_{2}]</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>[Cu L_{2}(NO_{3})_{2}]</td>
<td>9mm</td>
<td>8mm</td>
<td>-</td>
</tr>
<tr>
<td>Positive</td>
<td>30mm</td>
<td>25mm</td>
<td>26mm</td>
</tr>
</tbody>
</table>

4. CONCLUSION

Schiff base transition metal complexes Cu(II), Ni(II) and Co(II) were synthesised from furan-3-carboxaldehyde using 3-amino pyridine, and characterized on the basis of analytical and spectral data. Elemental analysis shows the metal to ligand ratio is 1:2. Conductivity measurements show all complexes are non-electrolytes. From SEM analysis crystalline nature of complexes is confirmed. Anti-bacterial study shows that all complexes are more active than ligand and Antifungal studies indicate their inactivity towards fungi.

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Dismantling Society and Networked Individualism: Understanding Social Interactions of Adolescents in Modern Sri Lanka

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Abstract

“Self”, which is considered to be the core of individual’s social behaviour has been divided into two complementary parts, i.e. online and offline, thereby increasing new patterns of social interactions, due to the prevalence of Social Network Services (SNS). The dividing line between online sphere and offline sphere of the self, continues to dissolve, as online activities become predominantly intertwined with almost every aspect of the social interactions. More than any other age group, adolescents are mainly subjected to the effects made by SNSs in modern societies. The study strive to understand how adolescents perceive their self and construct self-understanding within a networked society. It also studies the effects of that new self-conceptualization on modern day society, Sri Lanka. Grounded Theory was used as the methodology, and 8 cases were studied preceding a focus group discussion. Collected data, thus were analysed using codifying and concept categorization approach. Analysis reveals that, many unmet needs and inclinations of the offline life are strived to be satisfied with in the online life. Also, the skills needed for the offline existence of life have been decreased, due to the lack of awareness about the strategies necessary to perpetuate in the offline life. On the other hand, substantial portion of the monthly budget of an individual has subjected to be spent in order to maintain the online life. Though these effects seem to be quite negative on the society, there are some positive aspects as well. The online life is more accompanied with community activities and more politically engaged. Therefore, newly organized communities become strengthened in getting social support for many activities.

Key Words: Adolescents, Networked Individualism, self, SNSs

I. INTRODUCTION

Early sociologists mainly considered about apparent aspects (positivism) of any social phenomenon, and social facts became prominent as opposed to individual meanings given to a particular social phenomenon. However, social psychologists who represent symbolic interactionism held a different position in which both empirical evidences and individual meanings around social action are given equal importance(Dillon, 2014). When identifying the social action, therefore, the structure where the action is taken place must be taken into consideration with the meaning given by the initiator of that action. Any social action would not be possible to be identified only with one-dimension i.e. structural interpretation or meaning interpretation. Some notable
sociologist who represented the symbolic interactionism, therefore, introduced the concept of “Self” as a social and psychological construction which has been previously identified as a complete psychological construction.

Post modernization, a large number of social institutions has been transformed into new forms with several changes, partly because of the different involvement patterns by various age groups in social institutions. Adolescents who pass through the transformational stage in their biological lives, often involve in social interactions showing a specific pattern of behaviour as opposed to other age groups. As the modern society is organized in accordance with Internet and computer technology, adolescents’ behaviour in relation to social interactions has been enormously changed.

Furthermore, the concept of “Self”, which is considered to be the core of individual’s social behaviour is philosophically divided into two complementary parts, i.e. online and offline, thereby crystallizing new patterns of social interactions, since the prevalence of Social Network Services (SNS). Social Network Service is a major construction stimulated by innovations of the Internet technology, and more than any other epoch of the human history modern generation is more often exposed to the social network services, hence their behaviour in the modern society has become quite complex. The self which is exposed to the social network services, therefore, represents multifaceted nature integrating two complementary parts such as Online sphere and Offline sphere. The dividing line between online sphere and offline sphere of the self, on the other hand, continues to dissolve, as online activities become predominantly intertwined with almost every aspect of the social interactions. More than any other age group, adolescents are mainly subjected to the effects made by SNSs in modern societies.

This study, therefore, strives to understand how adolescents perceive their self and construct self-knowledge within a networked society. It also studies the effects of that new self-conceptualization on modern day society, Sri Lanka. Grounded Theory was used as the methodology, and 8 cases were studied preceding a focus group discussion. Collected data, thus were analysed using codifying and concept categorization approach.

The analysis reveals that many unmet needs and interests of the offline life are strived to be satisfied along with the online self. Also, the skills needed for the offline existence of life have been decreased, due to lack of awareness about the strategies necessary to perpetuate in the offline life. A substantial portion of the monthly budget of an individual is subjected to be spent in online life. Though these effects seem to be quite negative on the society, there are some positive aspects as well. Online life has more associated with community activities and more politically engaged. Therefore, newly organized communities became strengthened in getting social support for many activities. However, it is evident that more than any other circumstances, networked individualism make the necessary case for studying the current situation in depth.

II. RESEARCH PROBLEM

Adolescents are often inspired to embrace the social network services, as they are provided with new and thriving experiences. They are more actively engaged in SNSs compared to other age groups. Even though this is a trend in which the societies experienced, the necessary researches and studies are relatively little in number. Sometimes, the older theories related to structuralism or structural functionalism is not really possible to be used
in terms of understanding the above behavioural patterns. Newly constructed theories, on the other hand, has not been used quite extensively so as to understand Sri Lankan situation. Therefore, this research strives to understand how adolescents perceive their self-identity and construct self-knowledge within a networked society. Even though the social behaviour is determined by the collective consciousness, individual’s self has a substantial role to be played, since the self of an individual is constructed responding to the societal interpretations. Because of the self’s predominance in social behaviour, effects of the mode of thought (self-construction) on the code of conduct (Social behaviour) will also be studied in the research.

III. LITERATURE REVIEW

As SNSs become more prevalent, social behaviour of the people has changed dramatically adopting new facets necessary to continue within a networked society in which unprecedented global norms and values are accommodated. Therefore, previous arguments of the social behaviour of people have been challenged by many sociological theorists, since its inadequacy to understand the individual in a networked society. As Bauman (2000) specified, there are no solid structures around the social beings on which they can rely and invest, resulting liquid fear in a modern society where every institution is networked using virtual relationships. There are no solid structures and relevant functions in networked societies, as the institutions are constantly changed and adopting new faces so as to respond to dramatic changes due to global trends. Until recently, the people exposed to solid structures, and their behaviour in line with structural functions are appeared to be constant.

The intriguing achievement of the people in modern society is the “Liberty” which means “to set free from some kind of fetters that obstruct or thwart the movements; to start feeling free to move or act” (Bauman, 2000, 22p). Liberty as coined by Bauman, a situation where the people enjoy their freedom to act. A society in which the freedom of people is admired allows the adolescents to act free, particularly to access the Internet without any hindrances. This makes it clear that the selves of adolescents might be subjected to change due to the interactions with Internet services.

As a result of the above-mentioned change, people’s lives of this society have divided into two, as online part and offline part. The online part is associated with how people are engaged with SNSs, whereas the offline part is related with how they behave in everyday lives as opposed to online activities. As Bauman (2000) and Castells (2004) noted, the dividing line between these two parts is continued to be dissolved. Therefore, understanding the real nature of the self would not be an easy task.

The sense of being lived or so called the “self” is the core of social interactions of an individual, though sometimes it has maladjustments due to the imbalance of perceived self and ideal self (Rogers, 1980). Perceived self is the acquired identity of a person and which is real, on the contrary, the ideal self is not real but it is the one which is ought to be achieved by a person in terms of his or her expectations. Probably, as the SNSs prevail, ideal self has associated with the online part and perceived self has accompanied with the offline part of the life. Much of the unreal identities and ideal expectations are achieved or satisfied using online activities which help the person to balance the ideal self and perceived self. SNS, therefore, is not just a simple platform in which the persons are attended since it makes complex forms of social actions in a networked society (Castells, 2004).
Adolescents are often inspired to embrace social network services, as they are provided with new and thriving experiences. Adolescents are claimed to be explorers than any other age group, hence they are more involved in online activities, as an efficient mean to be followed. They are more actively engaged in SNSs compared to other age groups (Boyd, 2015). Tufekci, furthermore, argues that dividing line between adolescents’ offline life and online life has continued to be liquefied or dissolved, as online activities become more and more intertwined with almost every aspect of everyday life (Tufekci & Wilson, 2012). The more involvement with the online activities, the more those activities become constant in everyday life.

As researched by Hampton et. al. (2011), digital technology plays a considerable role in people’s social world. The social world is a place where people interact with each other. The social world is not only a structure in which the people’s agency is not required but a place where individuals’ agency in line with structural principles is needed. “Habitus” or how people perceive their identity and self, Bourdieu (1990) argues that, a considerable determinant in which the social world’s arrangement is constructed. Post modernization, many of the individuals perceive their identity and self accordingly with principles of the networked society. “Habitus” is defined as “systems of durable, transposable dispositions, structured structures predisposed to function as structuring structures, that is, as principles which generate and organized practices and representations that can be objectively adapted to their outcomes without presupposing a conscious aiming at ends or an express mastery of the operations necessary in order to attain them” (Bourdieu, 1990). He argues that habitus allow individuals to find new solutions/roles to new situations/statuses based on their social situation and experiences. Adolescents, therefore, strive to transform their habitus to adopt new roles to new statuses, in that, the principles prevailed in the modern society are noticeably redefined upon how people are accessed the social network sites.

Hampton et. al (2011) specified that the number of those using social network sites has nearly doubled since 2008 and the population of SNS users have gotten older. Furthermore, Facebook users are more trusting than others and, SNS users have closer relationships as opposed to offline relationships, therefore, they get more social support than other people. Nevertheless, SNS users are more politically engaged when compared to non-SNS users. The distinguishing factor they found was that a large number of SNS users were aged between 18 to 22 years. As with the use of most social media, SNS users are disproportionately female. Moreover, nearly twice as many men as women use LinkedIn a prominent SNS, whereas all other SNS platforms have significantly more female users than male users. The tendencies of using SNS differ by several determinants, including but not limited to age, gender, ethnicity. However, age can be considered as a prominent element which affects the use of SNSs.

Recently some sociologists and social scientists argue that networks may provide a better metaphor to understand social forms of organization and learning (Ryberg & Larsen, 2008). Learning which is a major social activity has long been identified and interpreted without the influence of modern Networked Social Structure, however, networked individualism as reconceptualised in-line with pedagogy, Ryberg and Larsen (2008) argue that education is also associated with networked social identities. Though some argues that the modern networked social sphere is a place where many of the people are deceived, and the real identity is camouflaged or disguised, the construction of ‘sincerity’, Ryberg and Larsen (2008) emphasised that “ how the identity of
young people is neither fragmented nor characterized by ‘role playing’, but rather how most of the young people
strive to construct themselves with an identity that appears as sincere and real as possible” (2008, p. 6).

Networked society is not just a structure but a process which is constantly changing, and responds to the
bubbling concerns of a particular space and time. Online life of the adolescents is recently not limited only to
some internet platforms such as Facebook, Instagram, etc., but highly responsive mobile apps (mobile friendly
applications) provide necessary and interesting facilities to the adolescents to keep up their circadian social
interactions. Feminists like Frizzo-Barker and Chow-White (2012) write that internet-based new applications
commonly known as ‘apps’, can be viewed as simultaneously empowering and constraining for women’s
experiences and identities due to their potential to foster ‘always on’ forms of sociability in both public and
private spheres. Argument of public sphere (Habermas, 1987), nowadays cannot be discussed only with social
and political perspectives, on the contrary it must be reinterpreted with norms of networked individualism. As
noted by Frizzo-Barker and Chow-White (2012), people and artefacts, undoubtedly, co-evolve, and today,
technology can facilitate and restrain gender power relations. Artefacts or non-human actors may be a critical
part of activities of human actors, though it is not quite clear and apparent (Latour, 2005).

Actor-network theory, as described by Latour (2005), is a theoretical argument to interpret a society where
everything in the social and natural world exists in constantly shifting networks of relationships. It posits that
nothing exists outside those relationships. This argument is important when identifying hidden patterns of social
interactions of adolescents in which human and non-human actors are interrelated.

In terms of contextualizing the concept of ‘Networked Individualism’—a term coined by Bauman (2000)—to
Singapore community, Chua (2013) says that people are now free to decide which network members to activate
and for what tasks. The terms prevailed in a networked community, represent an unprecedented patterns of
social interactions. For example, now people including adolescents have an option that which member of the
online community to be selected, and the selection also can be specified in terms of the tasks. This is not true of
offline community. He, furthermore, argues that “while networked individualism is a modern trend, categories
such as gender, ethnicity and class, do, in addition to personal autonomy, structure how people match role
relationships to tasks” (602p). Wang, Chua, and Stefanone (2015), similarly demonstrate that “strong and weak
ties are both important to the personal well-being of college students in Singapore; and different communication
channels are associated with different kinds of social ties. Mobile and social media play a critical role in these
social ties” (1p).

Based on a survey of participants in Egypt’s Tahrir Square protests, a social movement in which the society has
driven to an unprecedented transform, Tufekci et al. (2012) demonstrates that social media, and Facebook, in
particular, provided new sources of information the regime could not easily control and were crucial in shaping
how citizens made individual decisions about participating in protests, the logistics of protest, and the likelihood
of success. General people, on the other hand, learned about the protests primarily through interpersonal
communication using SNSs (Tufekci & Wilson, 2012). This makes it clear that political engagement as an
advanced pattern of social interactions is also subjected to the effects of SNSs. More than any other instigator,
therefore, SNSs play an important role in stimulating adolescents’ social interactions.
In terms of collective consciousness, the main element of a society which differentiate ‘society’ from ‘individual constellation’, is imposed on individual behaviour and transformed it into a social action (Durkheim, 1982). Even though the social behaviour is determined by the collective consciousness, individual’s self has a substantial role to be played, since the self of an individual is constructed responding to the interpretations make through social relationships (Cooley, 1998). Post modernization, with the introduction of Internet services, collective consciousness has adopted new facets to entwine with emanating unprecedented situations. Emerging online-self appears to be a single concept, however, it is also an element which is organized in accordance with the collective consciousness (Castells, 2004), since the liberty, independence or freedom of any kind is granted to a person, provided that the person is goingalong with the socially accepted regulations or norms (Bauman, 2000). Norms of a networked society are considerably different, and sometimes those may violate offline norms of a society as well. Individuals’ agency of the social structure, therefore, is quite significant, as self-regulated norms and socially imposed norms are conflicting each other to be stabilized constantly.

Because of the self’s predominance in social behaviour, effects of the mode of thought (self-construction) on the code of conduct (Social behaviour) in a networked society is an important area to be researched. Apart from some anthropological studies and policy researches, the studies around social behaviour of adolescents in a networked society are less in number, in terms of the present situation in Sri Lanka. This study, therefore, will be strived to understand how Sri Lankan adolescents perceive their self-identity and construct self-knowledge within a networked society.

IV. METHODOLOGY AND DATA ANALYSIS

Grounded theory was employed as the methodology and 8 cases were studied since this is a qualitative study. The grounded theory holds constructivist epistemological consideration (Byrant, 2007) and involves understanding human experiences referring to an actor’s perspective. First, a focus group discussion was conducted using a purposive sample and then being directed by the informants, 8 cases were studied. Each one of the participants is 19 years old and freshmen to university studies. An unstructured questionnaire was constructed using the experiences obtained at the focus group discussion and interviewed the other 8 informants subsequently. Some of the categories (theoretical units/information) drawn from the first stage had been theoretically analyzed, once four of the cases were studied. Therefore, it was highly considered about the emerging categories in the second stage of the study. From the beginning of the study, the analysis was started using codifying and concept categorization method.

Disposition or the habitus of the university students is considerably different from the outside adolescents owing to the different environments in which they are exposed. This informed the research that emerging patterns of data would be limited to a particular area.

V. RESULTS AND DISCUSSION

1. Liquidation and interests’ satisfaction
More than any other circumstance, networked society makes the necessary platform for adolescents to achieve unmet interests in the offline life within the online life. The needs and interests hold different positions; probably needs are associated with the real self and interests with perceived self. Since the perceived self is hard to be achieved in most cases, theonline self is adopted as the platform in which those unmet needs are achieved, at least virtually, giving a self-satisfaction. Despite being satisfied, this will make an imbalance between offline life and online life.

Furthermore, networked society is a direct result of globalization process where market relations are predominantly operated. Much of the interests emanating from developed countries are distributed or diffused to developing countries like Sri Lanka, hence, much of the adolescents tend to absorb those interests in spite of the low level of achievement capacity. Because of the low level of achievement capacity, most of them are incapacitated so as to achieve expected interests. Interests are some expectations including, but not limited to material benefits. It is comprised of both material interests as well as non-material expectations. In terms of material expectations such as wearing an expensive dress, hardly to be achieved in offline life due to lack of different types of means. On the other hand, non-material expectations, such as expression of ideas to others, are often impossible to be acquired in a society in which institutions and functions are solidified.

Solidification is a process where social institutions and functions are rigidly and solidly organized and there are no sudden changes, whereas liquidation is a process in which most of the institutions and relevant functions are lightly organized and subjected to sudden changes. Networked society, a creation of the globalization, is a place where liquidation is entertained regularly. Institutions and human agency, therefore, are changed suddenly and no solid structures, in order to accommodate emerging structures. High expectations and low level of achievement capacity is one of the most important characteristics of a networked society, particularly with adolescents. However, psychological satisfaction associated with material gains and non-material gains is an important aspect of a networked society, since that is achievable at least virtually through online activities. Therefore, most of the adolescents are engaged in making online communities to make a better platform for sharing their ideas and achieving unmet psychological satisfaction in their offline lives.

“I have a Facebook account. Mostly I prefer to use an attractive name in the FB instead of my real name. I also uploaded an image.... but with some modifications through Photoshop. Sometimes, there are some mobile camera applications which modify our image attractively. If I upload that kind of image, definitely I would attract many members to my page”

Adolescents would not be able to hide their identity in the offline life since it is often visible and hardly to be falsified. Offline society is more solidified and structural functions are perfectly organized, hence, there is a self-survival mechanism of the society which is hardly breakable. In the online life, on the other hand, identity can be concealed as well as fabricated. Identity, a distinguishing feature of a person’s personality representing his or her world view is an important aspect which is associated with the interests, determines how the person achieve those expectations. Much of the unmet expectations, therefore, are achieved through online activities, with the intention of solely psychological satisfaction, but not includes any material gain.
Identity, alongside the self-actualization, is more important when adolescents are dealing with social institutions. Identity is also divided into two parts, such as online and offline. The offline identity is more prominent and visible to the community in real life and hardly to be forged. On the contrary, the online identity can be different that of the offline identity, since it is the representation of the ideal self. Therefore, it is easy to forge the online identity, as it is not quite visible to the online community, also it is not an important requirement in many cases.

2. Offline and online self-polarization

In terms of expectations, achievable ones are linked with offline self, whereas unachievable interests are linked on online self. As far as the expectations are achievable in the real life, they represent a high level of self-esteem and related to the offline self. If the expectations are hardly to be achieved in the real life, they are associated with the online self, and initiate a struggle to achieve a high level of self-esteem. This process seems to be sustainable, even though it makes an imbalance between offline self and online self. Despite being satisfied in the online life, unmet needs are crystalized in the offline life, hence it faces constant struggles to be balanced with online life. The online self, on the one hand, drives towards psychological satisfaction associated with non-real gains, on the other hand, the offline self moves towards real gains, thereby forming an ‘offline and online self polarization’, a process where the gap between online self and offline self is widened.

Offline and online self polarization is a socially instigated process, and a critical situation in which the adolescents, particularly in the developing world, are entangled when they strive to survive in the real social world. This makes an unstable or chaotic situation when adolescents as a particular social group in transition, make their personality structures in-line with the modern social norms.

3. Physical existence and Virtual existence

Social beings, including adolescents live in the real world (offline life) at least for the purpose of physical existence. Biological existence is the foundation structure of human beings, and many social structures are based on biological or physical principles. Social structure and cultural principles are quite symmetrically driven with physical principles, as its ultimate goal is to survive. In a real world, however, the people including adolescents would be able to make fantasies as opposed to physical existence and are related with psychological satisfaction. Imaginary existence or fantasies in the real life is not a new thing to be revealed, but virtual existence is one of the spectacular pillars in a networked society. Virtual life of a person probably is related to the online life and is quite different from making fantasies. In a networked society, making fantasies have become a virtually real activity when compared to earliest times.

The physical existence, here understood as a fact which relates to the offline self, whereas the virtual existence is as a part of online self. The virtual existence is possible when the human agency in social activities is placed in a community where each and every member is granted the same authority and power. Recently, adolescents
make online communities in which partnership for common interest is attended, that in return makes necessary arrangements to act and react in a virtual place, such as Facebook, LinkedIn, Instagram. By way of using such SNSs, every participant would be able to engage in any virtual activity like posting current situation, uploading images, like the others, share the other’s posts etc. Lexical resources, therefore, are newly generated and generalized within the online communities and which are unique to those spheres. For example, posting, sharing, liking, messaging, uploading, texting are some of the terms in online-life-vocabulary and the meanings are contextual.

Nevertheless, the online life is used as a place to share details about the offline life among virtually connected members, which is an intriguing situation. Since it makes a community which is more similar to a real community, particularly the adolescents, strive to share their real life situations through online platforms, and that makes their online life more prominent, provided that the online self is symmetrically organized as the offline or real self.

“I like to share some events of my life through FB and some of the photographs probably are shared through Instagram. So, I can hear what others say... Anytime, when an important event happens, I post it on the FB. Not only that, when I am sad, I will post it even.”

The problem, however, is risen when the online self is asymmetrically arranged as opposed to the offline self. In a real life situation, members of a community are interrelated by way of trust and faith, which accommodates the members to act with conscience. The members of a virtual community, whereas, is not arranged by way of trust and faith, but through common interests. The common interests of a real community are also based on faith and trust, however, the common interests of a virtual community are not based on trust and faith, but based on the likeness in which mere preference of the members are accumulated. Without trust and faith, the online self might be organized asymmetrically from the offline self, means that the online self is placed far from the offline self. For instance, some of the students who follow humanities are pretended to be the students following engineering subjects in the relevant faculties, in order to be privileged, at least in the virtual community, as scientific subjects are more privileged than humanities in Sri Lanka. This makes it clear that interests or unmet expectations related to the perceived self (here online self) are placed quite far from the real self (here offline self), thereby making a substantial imbalance between the real self and the perceived self.

Even though the connected members are equally granted some activities within the online world to be triggered, the faith which is the gluing factor has been missing. Everyone would be able to make comments, post details about situations, share some ideas, in spite of having a faith which is missing. As the dividing line between online life and offline life dissolves, the faith continues to be dissolved. Furthermore, this is why fabricated life situations and non-real facts are possible to be shared among connected members through online platforms such as SNSs. This is not a chaotic situation, as far as the adolescents manage their online and offline life separately, however, this not a skill which could be expected from adolescents as they are in a transitional stage both in psychologically and biologically. The online life and related habitus, therefore, subdue and dominate the offline life, which makes the adolescents more vulnerable to unexpected circumstances.
4. Preconditions for a risk society

The offline world is comprised of spontaneous risks, so the adolescents cannot avoid meeting strangers and catastrophes. In dealing with those situations, adolescents have to develop some skills, though the online self does not permit the person to do so, due to unreal and virtual practices. The online life, as opposed to the offline life, is a sphere in which the entrants of strangers are not allowed. Many adolescents create comfort zones through online platforms where they can refuse to face the strangers. Most of the SNSs are used, not in order to learn and understand different people with different habitus (mode of thought) so as to deal with them in unexpected situations. But strangers (those who are not matched with the concerned person) removed off to create a comfort zone where no strangers are present. Therefore, adolescents forget the skills which are absolutely necessary in the offline life and this will result in unexpected social problems in the present society.

Exposing to unexpected situations and strangers is an inescapable aspect of the offline life, consequently the people including adolescents must acquire some skills to deal with them, otherwise, the human existence will be threatened. However, the skills needed in dealing with unexpected situations are disentitled from adolescents, once they are completely got adjusted to the online life. In a real life situation, a small number of adolescents who expose to online activities gradually lose the relevant skills need for the survival, on the contrary a large proportion of people including adolescents still continue to stick to traditional norms and learn skills which are considerably needed in dealing with unexpected situations and persons within the offline life. This makes a polarized relationship between two categories of persons above mentioned, which makes the aforementioned group (adolescents who are adjusted with online life) more vulnerable. They do not aware of the offline life situations much, however, the online life is highly valued. They, therefore probably, would strive to use online strategies in dealing with offline incidents, though the strategies used are not really matched with the situation.

“I just think that I can get on with the people more friendlier through the FB, but in real life, it is really impossible. When I find my life partner, probably I would prefer to choose one among the FB community members or through FB. It is the current trend... so why shouldn’t I try...?”

In terms of marriage, for example, one of the solid structures in the offline life is organized in accordance with rigid principles, particularly in Sri Lanka. As opposed to developed or modern countries, many of the developing societies are placed in between traditionality and modernity, hence they continue to practice both traditional practices as well as modern practices. Moreover, in Sri Lanka, a large number of adolescents got used to online life and they are strived to practice modern norms thereby adopting liquid strategies upon solid structures. On the contrary, some of the solid structures and functions are still thrived and supported by a considerable proportion of the people of the country. Liquid strategies adopted by adolescents, therefore, will be struggled with solid structures making an unstable situation in the society. As the online strategies are adopted by the adolescents in dealing with these solid structures, so there will be mismatching situations between liquid strategies and solid structures and will result in a risk society.
5. Economics of the online life

A substantial portion of the monthly budget of an adolescent is devoted to the maintenance of the online life. A networked society where online life is predominated is a direct result of globalization in which the economic liberation is admired. Always, therefore, maintenance of the online life is required a considerable amount of money. The online life requires some advanced technologies and related equipment, for example in order to be a part of an online community, it is required to have a computer or a smart phone, internet connection and a relevant knowledge base. These all the resources are hardly to be consumed without spending money. Furthermore, both material resources and non-material resources are required so as to maintain a stable online life, however, non-material resources including the relevant knowledge is more important. As it is argued, the spending on the online life would not be a matter, if the person is employed. For adolescents, particularly in Sri Lanka, expenses for an online life would be a great matter of concern, since they are not employed or earners.

Though they are not earners, money earned through the offline activities in many cases, by parents is spent on the adolescents’ online life, which is not productive at many times.

6. Virtual community emergence

Real life community organizations are dismantling, as the online communities are strengthening and absorbing more and more adolescents due to its attractiveness and other sophisticated features. However, online communities are not always real but represent a real common-interest shared by a virtual community, thereby giving the opportunity to adolescents a preferable platform for discussing and enjoying their interests. These communities are more socially and politically engaged.

“I am a sociology student, and we have a common group. If I have a problem regarding the subject, I will post it on the wall. Then anybody can respond to it. Sometimes, teachers also comment to the problems…. There are some situations where the classes are spontaneously canceled or put off. At that time the FB and WhatsApp groups are more important in order to distribute the message quickly”.

Conventional social capital, a strengthening force of a community is important, as the bond and the trust among members are crystallized. It is a capital which can be invested in human relationships and the members of the community would be able to receive some benefits. However, a new way of social capital relies on SNSs activities, and the participating members are getting more benefits (Such as education support, information sharing etc.) compared to those who do not participate in SNSs. SNSs provide efficient and more effective ways of communicating with group members, and the communication is more advanced. Despite some bogus information, SNS is a great platform to be used so as to create tight social bonds. Virtual Community is a direct result of this bonding capital in which the sameness of the members is strengthened. On the other hand, conventional definitions of social capital must be redefined as the online communities are getting more and more prevalence in the modern networked society.
7. Abnormality and alienation

The practice which is obtained by individuals through online life is not always compliant with the offline norms. Normal structure in the online life can be an abnormal structure in the offline life, so the adolescents quite often get used to the online life and became alienated from the normal life structure in the offline life. Norms, a set of socially constructed principles which govern human behaviour are signified in accordance with what people think as normal. The offline life and the social structure are organized based on norms. Moreover, the relativity is one of the most important characteristics of a norm. A set of principles which are believed be normal in a particular social context may be considered as abnormal in another social context. This is quite true with offline life as well as online life.

“Though I like to post events on the FB wall, my mom and brother do not like it. Sometimes they blame me on that. They say that we do not need to share each and every event in our lives through social media.”

Much of the norms which are entertained in the online life, quite often different from the offline life. As the offline life continues to use traditional and existing norms, newly introduced online life-norms will be in a struggle to be aligned with the solid structures, and this makes an imbalance between online norms and offline norms. As a result, adolescents who got used to the online norms have become alienated from the offline life, as they could not align with offline structures. Though the online norms are not considered abnormal within the online sphere, they are most probably considered abnormal in the offline sphere.

VI. CONCLUSION

Prevalence of the usage of SNSs among adolescents as a result of network-technology-sophistications has been a prominent fact influencing their social interactions in the modern day. There are many advantages of using SNSs, though there are some harmful effects on the everyday life. A person’s life world cannot be identified only by the offline part, but the online part must be taken into consideration, as it plays a vital role constructing the self which is a core force of mutual human interactions within the society.

As the network technology expands its coverage over a society, both material culture and non-material culture continue to change rapidly. Consequently, solid structures of a society have been changed, and become liquidated. The online self which is associated with the online life often adopts liquid norms so as to align with liquid structures, whereas solid structures of a society are dismantled. Adolescents’ behaviour in particular, thus is changed as to align with liquid structures. In some way, however, solid structures continue to thrive, thence there will be a constant struggle between solid structures in which offline self is associated and liquid structures where online self-associates.

Within a transitional period of a society, some mismatching structures may emerge, where pre conditions for a risk society appear. Struggle among online norms and offline norms, also considered to be an intriguing reason for a risk society. Furthermore, maintenance of the online life is not for free but it highly concerns about economic aspect as well. As a result of globalization, recently conventional community organizing has been overwhelmed by virtual community organizing. This seems to be a structural change, however, it closely associates with human habitus which is the way in which people, particularly adolescents, think and work in dealing with social situations.
In conclusion, it is argued that the conventional social structure has been dismantling, as the networked individualism predominates over solid structures. The existence of the solid structures of a society has been challenged, owing to the prevalence of networked individualism, an intriguing consequence of globalization process. Therefore, a question is emanated as to what extent the classical sociological theories can be used understanding the above phenomenon.

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Future of Solar Energy in Libya

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Abstract- With increasing demand for energy and international payment to reduce carbon emissions from fossil fuels, Libya's solar conversion technologies are currently facing obstacles and cost-saving technologies for a complete energy system. This paper examines the most important sources of renewable energy in Libya, namely solar energy and through the solar energy data obtained from the solar energy research center in Tripoli Libya, that Libya is rich in solar So tremendously.

The goal of this paper is Assess the monthly average of solar radiation and the duration of sunlight to study the distribution of radiation and duration Sun rays over the city of Tripoli in Libya.

Index Terms- Solar energy ,Tripoli , Libya.

I. INTRODUCTION

Libya is experiencing rapid growth in demand for electricity and potable water at low cost Currently, according to studies available to us today, the demand for electricity in Libya will exceed 115 gigawatts by 2030 unless alternative energy is produced and the application of systems to conserve energy sources.

The total demand for raw fuel for energy, industry, transport and water will increase by 1,600 million six hundred thousand barrels per day in 2010 to the equivalent of 3 million barrels per day by 2030[1].

Libya now reaches the power cuts for large hours throughout the day, it is no longer possible to postpone the use of solar energy in Libya. We call on through this paper the Presidential Council and the House of Representatives to take the necessary measures to take our country the appropriate position in the field of research and applications of solar energy in the era After Oil, Libya is one of the countries that are rich in solar energy. Its climate is shining throughout the year. The source can be exploited by setting up a photovoltaic. This depends on silicon and Libya is very rich in silicon.

The solar energy in Libya can be measured by the solar radiation rate of 7.5 kW per day in the promising areas, which receives between 3000 and 3,500 hours of sunshine each year, which means that harnessing these possibilities will not pose any competitive problems in exploiting This is because the desert accounts for 88 percent of the total area.

II. METHODOLOGY AND RESULTS.

The paper used a variety of research methods, including fieldwork and data collection, on the monthly rate of solar radiation on the city of Tripoli to collect evidence and information on the potential of solar resources in Libya. Several interviews were held with experts, managers, engineers and academics working in the energy, solar and meteorological sectors, including the Solar Energy Research Center in Tripoli Libya.

III. SOLAR ENERGY AS A SOURCE OF ENERGY IN LIBYA.

According to the Renewable Energy Authority of Libya, the average brightness of solar energy is about 3200 hours per year, the average solar radiation is 6 kWh per square meter per day.

Figure 1:energy on a map in Libya

The researcher also collected another set of data produced by the readings of the Climate Data Station at the Solar Energy Research and Research Center in the capital Tripoli during the period 2011-2016 at an altitude of 65.14 meters, 32.48 latitude [2] as shown in Table1
### Monthly average of solar energy in the city of Tripoli (km / h) 2011-2016

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Table 2: Monthly average of solar energy in the city of Tripoli (km / h) 2011-2016

IV. FUTURE PROJECTS FOR RENEWABLE ENERGY IN LIBYA

Libya is experiencing rapid growth in demand for electricity. According to the studies available to us today, the demand for electricity in Libya will exceed 115 gigawatts by 2030 unless alternative energy is produced and the application of systems to conserve energy sources. Libya needs renewable energies to be effective, practical, serious, economically and sustainably in order to produce energy, which in turn will allow the preservation of Libya's oil and gas resources for future generations. In order for Libya to provide sufficient energy demand from renewable sources, gradually to Libya so that 50% of the production of electricity depends on sources other than crude oil (oil) by 2040. One of the most important projects that make Libya one of the most important countries in renewable energy is a project.

4-1 Desert Tech Project

A project that makes Libya one of the largest exporters of solar energy produced from solar energy to Europe. More than one hundred electric generators, each equipped with thousands of huge mirrors, convert solar energy into electricity for transmission by submarine cables to Europe and then distributed to all parts of the European continent. Billion watts of power can be generated in this way, enough to provide six times the electricity needs of Europe, contributing significantly to significant reductions in carbon emissions. At the same time, the plants could be used as desalination plants in desert countries that desperately need fresh water. And makes Libya one of the largest energy exporters to Europe. Oil may run out but solar energy is inexhaustible. Thus, will be the real alternative, which will be one of the pillars of the growth and stability of Libya.

(Desertec) or desert technology is one of the best projects... it aims to supply Europe with a card extracted from the sun in North Africa and the Middle East. The project is expected to produce about 60 Terra kilowatts per year between 2020 and 2025, and the quantity will rise to 700 Terra kilowatts in 2050 at a price of € 0.05 per kilowatt.

That one square kilometer of the desert is capable of producing 250 GW (1,000 million watts) per year, which means preventing the emission of 150,000 tons of carbon dioxide, which would have been exported if the same energy had been extracted by burning oil fuel. North Africa and the Middle East were selected geographically from Europe.

Extracting electricity from solar energy is not a futuristic technique in itself; it is part of the existing reality. It is now being
used to meet the growing global energy needs. It is interesting here that the North African Sahara receives solar radiation at a rate of 7 times its fall on Central Europe per square meter per day. A project is looking to cover European energy needs by approximately 15-20 per cent and a high-unsustainable percentage of other countries’ energy and freshwater needs on the Mediterranean coast.

**What are the elements of Libya to receive this huge project:**

**Libya is considered the strongest candidate for the solar energy project for the following reasons**

1. The project is fully planned and ready for implementation. The company expressed its willingness to give Semnan a seminar on it.
2. The geographical location of Libya, where near distance to Europe represents an important factor for the export of this energy.
3. Increase the number of hours of sunshine, especially in the summer.
4. There is a huge network of power transmission towers.
5. High temperature in the Libyan desert.
6. Ease of land acquisition in Libya and this factor caused a problem in Europe.
7. The availability of fresh water in the Libyan desert in very large quantities.
8. The establishment of part of it on the Libyan coast provides fresh water for drinking and agriculture as well.
9. Being in the bed area for example has several advantages.
   - Leveling the area making it easy to erect solar mirrors.
   - near the productive bed project, which saves the price of agricultural crops. and therefore, expect a boom in agriculture and animal in Libya.
10. Electricity can be stored in Mount Nafusa and Green Mountain for re-use at night and avoiding peak hours.
11. Provide fuel and spare parts for gas and steam stations. Which cost fictional figures. And benefit from other projects.
12. Stability of the public network and avoid frequent interruptions.
13. Gas stations are operating reserves and are very important as reserves in case of necessity.
14. A huge financial income into the treasury of the Libyan state.
15. The presence of raw materials for solar mirrors, such as silica sand used in the manufacture of mirrors. And diatomite, which manufactures thermal insulators [3].

**V. CONCLUSION**

There is a high-level strategy to focus on renewable energy and reduce pollution and carbon emissions in Libya. However, the current political situation in Libya has put most renewable energy projects and strategies under implementation and perhaps even a more stable situation by reviewing literature, field visits and secondary data shows that the demand for energy in Libya is increasing and renewable energy could be a solution to cover some of this request. Despite recent political changes in Libya, renewable energy remains of strategic importance. Solar and wind energy are major sources of renewable energy as well as wave and tidal energy. There is a need to attract investors to renewable technologies by strengthening existing infrastructure and laws. Renewable energy technology is still in its early days in Libya. There is still a need for a clear strategy and time-frame to move forward, particularly with regard to the development of the skills and knowledge required for the installation and maintenance of such systems.

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Involvement of Man and Women in Paddy Cultivation Operation

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Abstract- The study was conducted in Kurukshetra district of Haryana state with the objective of analysing the involvement of man and women in paddy cultivation. Two blocks from Kurukshetra district were randomly selected i.e. Thanesar and Ladwa block. Two villages from each block were selected randomly. From Kurukshetra district 30 households from each village were selected randomly thus making a total sample of 120 households from different socio-economic categories. The study revealed that the average workload of men and women of low socio-economic strata were higher than those of medium and high socio-economic strata, in operation like Land preparation, Nursery raising, Manure and fertilizers application and Intercultural operation. It may therefore, be inferred that landless women and men performed more work in paddy cultivation than the women and men of medium and high socio-economic strata.

Index Terms- women, man, and paddy operation

I. INTRODUCTION

In developing countries, one third of total population was peasant and women. These women mainly work in their land and produce food for their family. Women get only one tenth of the total income of the world and were owner of less than 1 percent assets. They were lagging behind in representation of household heads, in education and in socio-economic conditions. They were not only involved in transplanting, weeding, application of fertilizer and harvesting but also raising and rearing of small and large ruminants, their care and marketing.

Women play a significant and crucial role in agricultural development and allied fields. It is most unfortunate that the role of women in agriculture has not yet been highlighted in India. They still remain as invisible workers. It has been observed that more than 75 percent women are involved in activities like winnowing, weeding, grading, threshing and cleaning of field farm operations. The physical strain of female farmers seems to be too high because of heavy work tasks of various activities done by them in agriculture and allied field (Singh and Vinay, 2013).

According to 2011 census, India’s total population is 121 crore, there are total 62.37 crore males and 58.64 crore females in India and in Haryana males population is around 1.35 crore and female population is 1.18 crore. According to the census, 56.7 percent of the main workers labour force employed in the agriculture and allied activities which reflect the predominance of agriculture in the matter of employment opportunity. In spite of having a significant place in the economy, this sector is facing various problems.

Women perform 66 percent of the world’s work, produce 50 percent of the food, but earn 10 percent of the income and own 1 percent of the property. Globally, women represent 49.6 percent of the total population, but only 40.8 percent of the total workforce is in the formal sector (World Bank, 2011). Haryana has about one million hectare land under rice cultivation, which is mostly irrigated. The state average productivity is about 3.1 tonnes/ha. Rice is grown in 18 districts of Haryana. Out of which seven districts are in high productivity group i.e. yield more than 2,500 kg/ha. Throughout the world, rural women historically have played and continue to play an important role in rice production; because women provide a source of cheap labour for rice cultivation. The use of female labour in rice production is higher than male labour in the poorer families. In middle-class households, rice farming involved male and female labour almost equally.

II. METHODOLOGY

The study was conducted in Kurukshetra district of Haryana state with the objective of analyzing the involvement of man and women in paddy cultivation. Two blocks from Kurukshetra district were randomly selected i.e. Thanesar and Ladwa block thus making a total sample of 120 households from different socio-economic categories. A well-structured interview schedule was constructed for data collection. Data were collected personally by the researcher by paying repeated visits to the area. Frequency, percentage, mean, ‘t’ test and correlation were computed for analysing data.

Two villages from each block were selected randomly. From Kurukshetra district 30 households from each village were selected randomly.
III. RESULT AND DISCUSSION

A. Socio-economic profile of respondents
More than half of the respondents (60.8%) were of middle age group, illiterate (66.7%), belonged to lower caste (40.8%), having low family education status (76.7%) and with negligible social participation. Most of the respondents (72.5%) had joint family, medium family size (40.0%), owned mixed type house (66.7%), cultivator (41.7%) as their main occupation. Less than half of the respondents (40.0%) were landless, having 1-2 milch animals (36.7%) with medium material possession (68.3%).
Most of the respondents (54.2%) were having medium localite source of information utilization and low cosmopolite sources of information utilization (81.7%).

The results indicate that, in case of paddy cultivation there are seven operations namely land preparation, nursery raising, manure and fertilizers application, intercultural operation, spade work during irrigation, plant protection measures and marketing of grains, which was performed exclusively by men. There are only three operations namely shifting produce to threshing floor, keeping parts of grains for consumption and sun drying which was performed exclusively by women. The remaining five operations namely uprooting, transplanting, harvesting, threshing and winnowing are performed by both man and women. The results indicate that in case of paddy cultivation, the mean score of the involvement of farm men was more in high, medium and low socio-economic strata. Amongst the male dominated operations viz., land preparation, manure and fertilizer application, nursery rising, spade work during field irrigation, pesticide dusting and marketing of grains, the mean score of men of low socio-economic strata was higher than men belonging to high and medium strata.

Table 1: Involvement in various operations- inter gender variation (paddy)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Operations</th>
<th>Socio-economic status</th>
<th>Men (Mean score)</th>
<th>Women (Mean score)</th>
<th>‘t’ test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>High</td>
<td>0.79</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium</td>
<td>0.73</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>0.82</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>0.78</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1.</td>
<td>Land preparation</td>
<td>High</td>
<td>0.59</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium</td>
<td>0.53</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>0.60</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>0.58</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>Nursery raising</td>
<td>High</td>
<td>0.34</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium</td>
<td>0.30</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>0.37</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>0.34</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>Manure and fertilizers application</td>
<td>High</td>
<td>0.52</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium</td>
<td>0.52</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>0.53</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>0.52</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4.</td>
<td>Intercultural operation</td>
<td>High</td>
<td>0.85</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium</td>
<td>0.75</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>0.77</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>0.78</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5.</td>
<td>Spade work during Irrigation</td>
<td>High</td>
<td>0.84</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium</td>
<td>0.72</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>0.74</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>0.78</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6.</td>
<td>Plant protection measures</td>
<td>High</td>
<td>0.35</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium</td>
<td>0.34</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>0.36</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>0.35</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Female dominated operations

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Operation</th>
<th>Socio-economic status</th>
<th>Men (Mean score)</th>
<th>Women (Mean score)</th>
<th>‘t’ test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Shifting produce to threshing floor</td>
<td>High</td>
<td>-</td>
<td>1.11</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium</td>
<td>-</td>
<td>1.19</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>-</td>
<td>1.24</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>-</td>
<td>1.19</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>Keeping part of grains for consumption</td>
<td>High</td>
<td>-</td>
<td>0.30</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium</td>
<td>-</td>
<td>0.33</td>
<td>-</td>
</tr>
</tbody>
</table>
The data further reveal that average workload of men and women of low socio-economic strata were higher than those of medium and high socio-economic strata, in most of the operations. It may therefore, be inferred that landless women and men performed more work in crop cultivation than the women and men of medium and high socio-economic strata. This may be mainly due to economic compulsions for sustaining their families for which they have to overburden themselves by agricultural work and that too in low paying, less skilled and monotonous activities.

The data further unfolds that ‘t’ value of jointly operated operation of uprooting of seedling, transplanting and winnowing was found to be statistically significant at 5% level of significance.

Relationship between independent variables and involvement of women in paddy cultivation operations

The results have been reported in Table 2 and 3. In case of women respondents’ three variables viz., age, caste and size of family were found to be significantly but negatively correlated with involvement in paddy cultivation. The data further reveal that four variables viz., land holding, milch animal, occupation and material possession were found to be significantly but positively correlated with involvement in paddy cultivation.

It may be due to the fact that younger women, belonging to lower caste having medium sized families used to undertake more workload. Whereas, the respondents having less land holding, having less milch animals, agricultural labourers having low material possession used to undertake more workload in paddy cultivation.

### Table 2. Relationship between independent variables and involvement of women in paddy cultivation operations

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Independents variables</th>
<th>‘r’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Age</td>
<td>-0.26*</td>
</tr>
<tr>
<td>2.</td>
<td>Caste</td>
<td>-0.28*</td>
</tr>
<tr>
<td>3.</td>
<td>Education</td>
<td>-0.20</td>
</tr>
<tr>
<td>4.</td>
<td>Family education</td>
<td>0.05</td>
</tr>
<tr>
<td>5.</td>
<td>Social participation</td>
<td>0.03</td>
</tr>
<tr>
<td>6.</td>
<td>Size of family</td>
<td>-0.36*</td>
</tr>
<tr>
<td>7.</td>
<td>Type of family</td>
<td>0.23</td>
</tr>
<tr>
<td>8.</td>
<td>Type of house</td>
<td>0.11</td>
</tr>
<tr>
<td>9.</td>
<td>Land holding</td>
<td>0.32*</td>
</tr>
<tr>
<td>10.</td>
<td>Milch animal</td>
<td>0.35*</td>
</tr>
<tr>
<td>11.</td>
<td>Occupation</td>
<td>0.26*</td>
</tr>
<tr>
<td>12.</td>
<td>Material possession</td>
<td>0.37*</td>
</tr>
</tbody>
</table>
* Significant at 0.05 level of significance

However, in case of men respondents variables viz., age, caste and size of family, type of family, land holding, milch animal and material possession were found to be significant but negatively correlated

**Table 3. Relationship between independent variables and involvement of men in paddy cultivation operations**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Independents variables</th>
<th>‘r’ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Age</td>
<td>-0.33*</td>
</tr>
<tr>
<td>2.</td>
<td>Caste</td>
<td>-0.28*</td>
</tr>
<tr>
<td>3.</td>
<td>Education</td>
<td>-0.15</td>
</tr>
<tr>
<td>4.</td>
<td>Family education</td>
<td>0.04</td>
</tr>
<tr>
<td>5.</td>
<td>Social participation</td>
<td>0.02</td>
</tr>
<tr>
<td>6.</td>
<td>Size of family</td>
<td>-0.37*</td>
</tr>
<tr>
<td>7.</td>
<td>Type of family</td>
<td>-0.26*</td>
</tr>
<tr>
<td>8.</td>
<td>Type of house</td>
<td>0.03</td>
</tr>
<tr>
<td>9.</td>
<td>Land holding</td>
<td>-0.29*</td>
</tr>
<tr>
<td>10.</td>
<td>Milch animal</td>
<td>-0.35*</td>
</tr>
<tr>
<td>11.</td>
<td>Occupation</td>
<td>0.18</td>
</tr>
<tr>
<td>12.</td>
<td>Material possession</td>
<td>-0.27*</td>
</tr>
</tbody>
</table>

with work load which might be due to the reason that the respondents who are young, belonging to lower caste, having large and joint family, more land holding and more milch animals used to undertake more workload in paddy cultivation.

**DISCUSSION**

Finding of the socio personal profile of the respondents revealed that most of the respondents belonged to middle age group, were illiterate, having medium sized joint family, belonging to lower caste, had negligible social participation and had mixed type of house. Majority of the respondents had low family education status. Similar findings were supported by Kumari (2009), Gita (2010) and Batra (2011). Finding of the socio economic profile of the respondents revealed that more than one third of the respondents were having cultivator as their occupation. Majority of the respondents were agricultural labour and landless, having 1-2 milch animals. Further, it was observed that majority of the respondents had medium material possession. Finding of Deepti (2008) supported the study.

The data further reveal that average workload of men and women of low socio-economic strata were higher than those of medium and high socio-economic strata, in most of the operations. It may therefore, be inferred that landless women and men performed more work in paddy cultivation than the women and men of medium and high socio-economic strata. This may be mainly due to economic compulsions for sustaining their families for which they have to overburden themselves by agricultural work and that too in low paying, less skilled and monotonous activities finding supported by Bala (2010).

The data further unfolds that ‘t’ value of jointly operated operation of uprooting of seedling, transplanting and winnowing was found to be statistically significant at 5% level of significance

**IV. CONCLUSION**

The average workload of men and women of low socio-economic strata were higher than those of medium and high socio-economic strata, in most of the operations. It may therefore, be inferred that landless men and women performed more work in paddy cultivation than the women and men of medium and high socio-economic strata.

In case of women respondents’ three variables viz., age, caste and size of family were found to be significantly but negatively correlated with involvement in paddy cultivation. The data further reveal that four variables viz., land holding, milch animal, occupation and material possession were found to be significantly but positively correlated.

In case of men respondents variables viz., age, caste and size of family, type of family, land holding, milch animal and material possession were found to be significant but negatively correlated.

**REFERENCES**


AUTHORS

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Correspondence Author – Anshu, anshugahlawat3@gmail.com, 9996968684.
Sexual Function Among Male Medical Students

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*Department of Surgery, Faculty of Medicine, University of Peradeniya, Sri Lanka
**Department of Community Medicine, Faculty of Medicine, University of Peradeniya, Sri Lanka

Abstract—Sexual dysfunction is a very common presentation in urology clinics. Although it is very common in elderly men which is estimated as 50% of all men aged 40 and 70 years old have this problem to some degree. Though it is more common among older age group 26% of men Under 40 year suffer from erectile dysfunction and more than half of them had severe type. Erectile dysfunction is associated with poor cardiovascular function, Ischemic heart disease and stress. Assessment of erectile dysfunction is a way to assess Psychological stress and future risk of Ischemic heart disease in a young population. It was a cross sectional descriptive study conducted in faculty of medicine, university of Peradeniya among male subjects, questionnaires was distributed and assessment of sexual dysfunction was done according to “International Index of Erectile Function (IIEF)”. In sample of 232 of male medical students (all were single), mean age of 23.49 ± 1.68 years with minimum of 18 years and maximum of 27 years. Only 1.3% was circumcised and 3.9% of them had lower urinary tract symptoms. In lower urinary tract symptom assessment nobody complains of intermittency, urge incontinence and stress incontinence. Among the subjects 79.3% of them were sexually active for previous 4 weeks. This included masturbation as well. Among them 1.7% were homosexual & 4.7% are Bi-sexual. In this study 2% had erectile dysfunction, 4.36% had orgasmic dysfunction, 6.16% had reduced libido, 3.1% had poor intercourse satisfaction and 9.4% have poor overall satisfaction. Half of them with any disability were severely affected.

In conclusion among male medical students in Peradeniya sexually active percentage is low and sexual disabilities are also lower than normal population. Low sexual active percentage was due to lack of free time and places. Condensed time table and heavy work load as a medical student might be the underline cause. Medical students had knowledge on physiology and pathophysiology of sexual dysfunction than others. Proper sex education reduced anxiety of sex as well as could have managed without affecting severely.

Index items- Sexual dysfunction, erectile dysfunction, International Index of Erectile Function (IIEF)

INTRODUCTION

Erectile dysfunction (which was referred to as Impotence in old literature) is a very common among elderly male which is estimated as 50% of all men aged between 40 and 70 years old have sexual dysfunction to some degree. Though it is more common among elderly age group at least 26% of men under 40 year suffer from erectile dysfunction and more than half of them are severe type [1].

To have a successful penile erection proper function of brain, nerves, hormones, muscles, circulatory system and emotions is required. Corpora Cavernosa is the penile erectile tissue, specifically the cavernous smooth musculature and the smooth muscles of the arteriolar and arterial walls, plays a key role in the erectile process. In the flaccid state, these smooth muscles are topically contracted, allowing only a small amount of arterial flow for nutritional purposes. Causes of erectile dysfunction can be physical and psychological. In young men psychological causes are more prominent than physical causes. [1] Feelings of sexual excitement that lead to an erection starts in the brain. But conditions such as depression and anxiety can interfere with that process. In fact, a major sign of depression is withdrawal from things that once brought pleasure. Stress about jobs, money, exams and other concerns contribute to erectile dysfunction. Alcohol and drug abuse are both common causes of erectile dysfunction among young men. Additionally, relationship problems and poor communication with a partner, performance anxiety can cause sexual dysfunction in men [2]. In our study we will be assessing erectile dysfunction in medical students as a descriptive study to assess the prevalence of erectile dysfunction. Here we are opening a path for another research to assess the causes for erectile dysfunction in this sample.

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• MATERIALS AND METHODS

This was a descriptive study conducted among male medical students in Faculty of Medicine, University of Peradeniya, except who were not willing to take part in the study and being treated for sexual dysfunction was recruited and questioners were distributed among them. They were asked to fill the questioner at leisure where their privacy was protected demographic data, marital/relationship status, urinary symptoms, assessment of sexual dysfunction according to “International Index of Erectile Function (IIEF)” was obtained. Students were asked to put their completed questioners to a box at the Department of Surgery, Faculty of Medicine, University of Peradeniya any time they are possible. Questioners were collected by investigators at every evening at 3.00 pm and data was entered in to data base in Microsoft office excel 2007. Data was analyzed using IBM SPSS statistic version 23.

• RESULTS

In sample of 232 of male medical students with a mean age of 23.49 +/- 1.689 years and minimum of 18 years and maximum of 27 years. They all were single with no major uro-surgical interventions.

Only 0.4% had been treated for sexual dysfunctions. Among the subjects 79.3% of them were sexually active during the previous 4 weeks including masturbation. Other 20.7% were sexually inactive. Among the subjects 1.7% was homo-sexual and 4.7% were bi-sexual. Others were hetero-sexual. Among the sample 59.1% had no sexual partner. 41.1% of them had female partners. 0.4% had male sexual partner. 0.4% had both male and female sexual partners.

In this study 2% had erectile dysfunction, 4.36% had orgasmic dysfunction, 6.16% had reduced libido, 3.1% had poor intercourse satisfaction and 9.4% have poor overall satisfaction. Half of them with any disability were severely affected.

IV.CONCLUSION

Among male medical students in Peradeniya sexually active percentage is low and sexual disabilities except reduced libido and overall satisfaction are also lower than normal population. Percentage of homo sexual and bi-sexual was also lower in the study sample than normal population. Percentage of having a sexual partner also was lower than the normal population.

V.DISCUSSION
Erectile dysfunction is defined as the inability to achieve and maintain an erection sufficient to permit satisfactory sexual intercourse.

According to the literature, Sexual problems don't only affect older men. One-third of men between ages 18 and 25 suffer from at least one sexual dysfunction, according to a recent study from Switzerland. Many of them were addicted to cigarettes, marijuana, illegal drugs, compared with those without premature ejaculation.(7) And also they have found out that men with erectile dysfunction were more likely than men without the condition to say they had taken medication without a prescription, which could indicate that young men with ED tend to self-medicate or possibly treat their own sexual problems.(6) Results also showed a link between poorer mental health, lifestyle choices, depression and both premature ejaculation and ED and depression. Age, smoking and obesity are the main risk factors. In about 20% of cases psychological problems are the causes (4).

According to our study, in normal young population more than 93% have regular sexual activities. The lower sexual active percentage was due to lack of free time and places for sexual activities. Mental stress due to condensed time table, work load reduces libido in both partners which also leads to reduce the time of sexual activities and overall sexual satisfaction. However, medical students have a better knowledge on physiology and pathophysiology of sexual dysfunction than other populations. Proper sex education reduced anxiety of sex well as could have managed without affecting severely.

5.5% are homosexuals and 2.1% are bi-sexual [Headbomb, 2016].Lower percentages are due to medical students get chances to co-operate with populations and they are considered as higher state peoples in the society according to the Sri Lankan culture. Therefore, psychological factors such as loneliness, refusing by hetero sexual are lower in subjects might reduce the percentage of homosexual and bisexual percentage. But Psychological stress, lack of time, Higher expectations, behave in a small population has reduces the percentage of having a sexual partner than normal population.

When a patient presents with erectile dysfunction, a thorough history (medical, sexual, and psychosocial) should be taken, the patient should undergo physical examination, and appropriate laboratory tests aimed at detecting these diseases should be performed. The physical examination should include evaluation of the breasts, hair distribution, penis, and testes; palpation of the femoral and pedal pulses; and testing of genital and perineal sensation. Recommended laboratory tests include urinalysis, a complete blood count, and measurements of serum glucose, creatinine, cholesterol, triglycerides, and testosterone while the patient is fasting. If the man's serum testosterone concentration is low, serum free (or bioavailable) testosterone, prolactin, and luteinizing hormone should be measured. Current medical interventions for the management of ED include oral drugs, intrapenile therapies (intra-urethral suppositories and intracavernous injections) and penile prosthesis implantation. Although considerable advances have been made, the ideal treatment of ED has not been identified [5].

Reference
02. Heidi Godman, Erectile Dysfunction in Young Men: Causes and Treatments, by George T. Krucik, MD, MBA on March 14, 2014


The Influence of Marketing Mix on Interest of National Health Insurance Patient Re-Visit in Polyclinic at Hospital X

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**Lecturer of Hospital Management, Muhammadiyah University of Yogyakarta, Indonesia

Abstract- In general, the problem that is often faced by the hospital is that the hospital has not been able to provide services that match the expectations of service users. Marketing mix is a set of tools that a hospital can use to shape the characteristics of services offered to customers (patients). The purpose of this study is to determine the effect of marketing mix on the interest of re-visit national health insurance patients in Polyclinic at Hospital X. This study used 75 respondents as polyclinic patients in Hospital X registered as national health insurance participants who are considered quite representative of the population studied. The sampling technique used a random sampling method on each polyclinic taken proportionately. The analysis model used in this research is descriptive analysis, and multiple linear regression analysis. The test results showed a significant positive influence both simultaneously and partially marketing mix to the interest of re-visit national health insurance patient in polyclinic at Hospital X. The results also found that the marketing mix on product variables had a dominant influence on the interest of the patient's re-visit. The conclusion of this research is that Hospital X should consider the marketing mix and prioritize the improvement of product mix such as the type of service provided, either in the form of preventive, diagnostic, therapeutic and others.

Index Terms- marketing mix, national health insurance, interest of re-visit, hospital

I. INTRODUCTION

In general, the problem that is often faced by the hospital is that the hospital has not been able to provide services that match the expectations of service users. This is because the quality of services provided is still low so it can not produce the services expected by the patient [1]. According to Kotler and Keller [2], the ideal marketing is holistic marketing where a holistic approach is based on ways to solve complex and broad problems. The holistic marketing characteristic is an integration of four marketing concepts namely, internal marketing, integration marketing, social marketing, and relational marketing. A marketing strategy that can be used in the marketing of a service product is the marketing mix [3]. The marketing mix initially consists of a combination of 4P (Product, Price, Promotion, and Place) and added with four other elements, namely People, Process, Physical evidence and Customer service. These variables need to be combined and coordinated so that the hospital can perform marketing tasks effectively [4]. Marketing mix is expected to increase consumer perceived quality that is consumer assessment to a product. If the consumer perception of the quality of service provided by the hospital well then the image of the consumer (corporate image) of the hospital will be positive, this condition can increase customer satisfaction or patient (customer satisfaction). The impact of patient satisfaction is Customer Loyalty which is consumer behavior as a result of the services provided [5]. In order to create customer loyalty, companies need to manage demand to be inelastic by adjusting the marketing mix, taking into account service quality, intensive promotion, and relationship marketing [4].

Hospital X is a hospital that has accreditation of type B. National health insurance is valid in Hospital X since 2014 in cooperation with BPJS (name of implementing national health insurance). data taken from the RS Medical Record Section showed the average visit of patients using national health insurance from January to March 2016 in the polyclinic was 19,718 patients and emergency department was 9,313 patients. So the total of all the patients' visits was 27,131 patients. The number of visits by 2016 is decreased when compared to the average number of patient visits from January to March 2015, i.e. polyclinic patients are 21,739 patients and emergency department installations 6,122 patients. The decline in the average of visits in 2016, is a problem that cannot be ignored by the hospital, especially the part that handles hospital marketing. In addition, in the era of national health insurance which began in 2014, patient visits become important for hospitals. Reduced number of national health insurance patient visits in outpatient polyclinics may result in reduced hospital outcomes as well as disruption of operations and inadequate patient care by hospitals.

Based on the case, the problem raised in this research is whether the marketing mix (product, price, place, promotion, people, process, physical evidence, customer service) influences the interest of the re-visit of national health insurance patient in Polyclinic at Hospital X.

Theoretical Basis

1. Concept of Re-Visit

Visits are the use of health facilities provided in the form of outpatient, inpatient, home visits by staff or in the form of other activities of the utilization of health care. The interest of the patient's re-visit in the health care is shown by the patient's visitation behavior to the health care unit as the level of
patient satisfaction to the health service. Interest in re-visit also means the patient's trust in the providers of health care in the fulfillment of their needs. The high interest of patient visits to health care facilities can be seen from the dimensions of daily, weekly, monthly and yearly [6]. Many factors influence the patient's re-visit. These factors should be able to be identified by health care providers in order to develop appropriate strategies to improve services and improve patient visits.

2. Concept of Marketing Mix
The marketing mix is a set of tools that a hospital can use to create the characteristics of the services offered to the patient. Tools in the marketing mix can be used to develop long-term strategies as well as to design short-term tactics programs. The marketing mix initially consists of 4P combination (Product, Price, Promotion, and Place). When viewed from the customer perspective then 4P can be formulated also be 4C (Customer's needs and wants, Cost, Communication and Convenience). In its development, a number of studies show that the implementation of 4P is too limited for the service sector so that this weakness leads many marketing experts to redefine the marketing mix to be more applicable to the service sector. As a result, the traditional 4P element is expanded and added with four other elements, namely People, Process, Physical Evidence and Customer Service. These variables need to be combined and coordinated so that the hospital can perform its marketing tasks effectively [4].

Product is a type of service provided, either in the form of preventive, diagnostic, therapeutic and others. This service should be viewed from the view of the consumer, meaning what can be given to relieve pain, cure illness, prolong life, reduce disability, etc. [7].

Meaning of price is not just a cost that must be paid for one type of examination or action, but the whole that must be spent by patients to get services in the hospital. According to Zeithaml (1998) in Tjiptono (2011), customer-oriented pricing is the perceived value of the product by both the economic and functional (industrial product) and psychological (consumer product) [8].

Meaning of place in the hospital includes the place of service, time spent, referral concept, and others. Location of the facility often determines the success of a service, because the location is closely related to the potential market of a company. For example hospitals generally occupy large areas and located near densely populated areas, as hospitals aim to serve the general public at large. Site and location selection requires careful consideration of the following factors:

1. Access, such as location is easy access to public transportation.
2. Visibility, such as a visible location from the curb.
3. Secure and spacious parking lot.
4. Expansion, which is available a place large enough for business expansion in the future.
5. Environment, ie the surrounding area that supports the services offered.
6. Competition, ie the location of competitors.
7. Government regulations

Meanwhile the concept of promotion in the hospital is how patients know about the types of services available in the hospital, how they are motivated to use, then use it on an ongoing basis and disseminate the information to their peers. Promotion is the process of communicating the marketing mix variables that are very important implemented by the company in marketing the product. The essence of promotional activities is a form of marketing communication activity that seeks to disseminate information, influence, remind the target market to be willing to accept, buy, and loyal products offered by the company. Promotion activities of health care that exist in a hospital is growing rapidly given the increasing level of competition between hospitals. Promotion of health care in their implementation should be in accordance with the existing health care in the hospital and pay attention to the marketing ethics described by the American Marketing Association (AMA) which includes honesty, fairness and avoiding conflict with the aim of attracting consumers [9].

People is a vital element for the service marketing mix. Elements of people in the marketing of services can not be separated with the customer. Elements of people in a hospital or company act as "part-time marketers" whose actions and behaviors have a direct impact on the customer's output. Therefore, service organizations that have high contact with their customers such as hospitals should clearly determine what is expected of each employee in their interactions with customers. To achieve the expected standard, recruitment, training, motivation and employee performance appraisal methods are important to improve employee quality and marketing mix [4].

Physical evidence in the marketing mix may take the form of a brochure showing buildings, well-dressed and polite employees, attractive internal and external decoration, comfortable waiting rooms, and so on. This physical evidence is important because services have intangible characteristics that cause potential customers to be unable to judge a service before consuming it. Physical evidence provides an overview of the characteristics of the services offered, thus reducing the perceived risk level of the customer in the buying decision [8].

Process in the marketing mix is related to the production or operation process which is an important factor for high-contact services consumers who often also acts as the co-producer of the services concerned. In the service business, marketing management and operations management are closely related and hard to distinguish clearly. The process elements in the hospital can be seen from the ongoing health care process starting from registration, examination, drug taking and payment [7].

Customer Service can be defined as total quality of services perceived by customer. Therefore, responsibility for this marketing mix element can not be isolated only in the customer service department, but should be concern and responsibility of all production personnel of the service organization. Quality management services offered to customers are closely related to production and personnel design policies [4].

The success of marketing program depends of integration between external environment and internal organization capabilities. Thus the marketing program as a process of matching process and especially important in the context of service. Marketing mix is at the core of the
company's marketing system. These activities need to be combined and coordinated so that the company can do its marketing tasks as effectively as possible. So the company not only choose the best combination, but also must coordinate various elements of the marketing mix to implement marketing program effectively.

The basic theories above and hypothesis are described as follows:

**Research Hypothesis**

Based on the theoretical study above, the hypothesis of this research are:

H.1. There is the influence of product variable on the interest of patient re-visit with national health insurance in polyclinic at hospital X.

H.2. There is the influence of price variable on the interest of patient re-visit with national health insurance in polyclinic at hospital X.

H.3. There is the influence of place variable on the interest of patient re-visit with national health insurance in polyclinic at hospital X.

H.4. There is the influence of promotion variable on the interest of patient re-visit with national health insurance in polyclinic at hospital X.

H.5. There is the influence of people variable on the interest of patient re-visit with national health insurance in polyclinic at hospital X.

H.6. There is the influence of process variable on the interest of patient re-visit with national health insurance in polyclinic at hospital X.

H.7. There is the influence of physical evidence variable on the interest of patient re-visit with national health insurance in polyclinic at hospital X.

H.8. There is the influence of customer service variable on the interest of patient re-visit with national health insurance in polyclinic at hospital X.

H.9. Marketing Mix factors that have the most influence on the interest of patient re-visit with national health insurance in polyclinic at hospital X are Products variable.

**II. METHODS**

This type of research used in this study is quantitative methods. Data in this research use primary data. Primary data in this study was obtained by making and distributing questionnaires to 75 patients with national health insurance at polyclinic X hospital as respondents.

The sampling technique was conducted randomly on each polyclinic taken proportionally using questionnaire. Data analysis technique in this research use multiple linear regression analysis. The regression equation expected in this research is:

\[ Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + e \]

where:
- \( Y \) = interest of patient re-visit (dependent variable)
- \( X \) = Marketing mix (independent variable)
- \( a \) = Price constants (price \( Y \) when \( X = 0 \))
- \( e \) = Error
- \( b_1, b_2, ... b_8 \) = the regression coefficient number which shows the increase or decrease in the dependent variable based on the independent variable. If the value of \( b \) (+) then there is an increase, if the value of \( b \) (-) then there is a decrease.

While hypothesis testing is done by F test, t test, coefficient of determination multiple \((R^2)\) and coefficient of determination partial \((r^2)\).

**III. RESULTS**

![Conceptual Framework](image)

Table 1. multiple linear regression

<table>
<thead>
<tr>
<th>Variabel Independent</th>
<th>Koef. Regresi</th>
<th>Beta</th>
<th>t statistik</th>
<th>Sig.</th>
<th>Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>-1.042</td>
<td>-3.293</td>
<td>0.002</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product</td>
<td>0.272</td>
<td>0.250</td>
<td>3.561</td>
<td>0.001</td>
<td>Signifikant</td>
</tr>
<tr>
<td>Price</td>
<td>0.166</td>
<td>0.192</td>
<td>2.756</td>
<td>0.008</td>
<td>Signifikant</td>
</tr>
<tr>
<td>Place</td>
<td>0.182</td>
<td>0.176</td>
<td>2.352</td>
<td>0.022</td>
<td>Signifikant</td>
</tr>
<tr>
<td>Promotion</td>
<td>0.183</td>
<td>0.186</td>
<td>2.654</td>
<td>0.010</td>
<td>Signifikant</td>
</tr>
<tr>
<td>People</td>
<td>0.152</td>
<td>0.161</td>
<td>2.075</td>
<td>0.042</td>
<td>Signifikant</td>
</tr>
<tr>
<td>Process</td>
<td>0.139</td>
<td>0.160</td>
<td>2.092</td>
<td>0.040</td>
<td>Signifikant</td>
</tr>
<tr>
<td>Physical evidence</td>
<td>0.137</td>
<td>0.148</td>
<td>2.105</td>
<td>0.039</td>
<td>Signifikant</td>
</tr>
<tr>
<td>Customer service</td>
<td>0.142</td>
<td>0.155</td>
<td>2.109</td>
<td>0.039</td>
<td>Signifikant</td>
</tr>
</tbody>
</table>
Based on Table 1, the result of F test is obtained \( F_{count} \) of 24.094 and probability (Sig-F) is 0.000 < 0.05, this means there is influence together marketing mix consisting of product, price, place, promotion, people, process, physical evidence and customer service to the interest of the patient's re-visit on Hospital X. While the adjusted coefficient R square = 0.714 which shows the independent variables together influence the dependent variable by 71.4% the rest of 28.6% influenced by other variables not included in the research model.

The test results of significance indicate that Promotion variable of 18.6% can be shown with the beta coefficient of 16.0%. This means that the interest of the patient's re-visit can be explained by the Process variable of 16.0%.

The test results of significance indicate that Physical evidence variable (X7) has a value for \( t_{count} \) of 2.105 and sig of 0.039 < 0.05. there is a significant influence of Physical evidence variables on the interest of the re-visit patient's at Hospital X while the influence of Physical evidence variables on the interest of re-visit patient can be shown with the beta coefficient of 14.8%. This means that the interest of the patient's re-visit can be explained by the Physical evidence variable of 14.8%.

The test results of significance indicate that Customer service variable (X8) there is a value for \( t_{count} \) of 2.109 and sig of 0.039 < 0.05. there is a significant influence of Customer service variables on the interest of the re-visit patient's at Hospital X while the influence of Customer service variables on the interest of re-visit patient can be shown with the beta coefficient of 15.5%. This means that the interest of the patient's re-visit can be explained by the Customer service variable of 15.5%.

### IV. DISCUSSION

1. The influence of product on the interest of re-visit

   Partially product variable significantly to the interest of patient's re-visit at hospital X. If seen from result of positive regression, indicate product quality offered either hence interest of patient's re-visit also consumer will higher. This is the dominant variable of interest in re-visit. Alternatives that are highly in demand by product offerings in hospital X due to the choice of products that fit the needs, such as specialist services provided by the hospital, Polyclinic Support services, Polyclinic patient registration, Polyclinic service and Physician services in non-discriminating polyclinics - Distinguish the type of patient assurance, it will increase the interest of the patient's re-visit. This is because the product is something that can be offered to the market for the benefit, or consumption and that can satisfy the wants or needs. It can not only be a physical thing, but it can also be a service, other unreal ideas. For a company that understands this, of course not only sell the product itself, but besides it also sells benefits of the product, because consumers not only buy a bunch of physical attributes, but buy something that can make his wishes satisfied.

2. The influence of price on the interest of re-visit

   Partially, the price variables significantly influence the interest of the patient's re-visit in hospital X. When viewed from the positive value of the regression coefficient, it indicates that the more suitable the price set by the hospital, according to quality, health insurance, the cost becomes lighter and get the service according to the insurance coverage, the interest of the patient's return visit will also be higher. This is because the tariff is the amount of money charged or a product or service or the sum of the value exchanged by consumers for the benefits of having or using the product on the service. So tariffs are a way for a salesperson to differentiate his offer from competitors. The more appropriate the price expected by the patient then the patient will feel satisfied, so the interest of patient re-visit better. A good tariff is indicated by the RS X
who can serve the national health insurance or BPJS, does not pay additional fees when seeking treatment at the polyclinic, obtaining services in accordance with the assurance and payment method in the polyclinic easy.

3. The influence of place on the interest of re-visit
Partially Place variables significantly influence the interest of patient re-visit at hospital X. If seen from positive value of regression coefficient, show the better place in hospital X hence interest of patient re-visit also will be higher. This is because the place in the hospital includes the place of service, time spent, the concept of referral, and others. Location of the facility often determines the success of a service, because the location is closely related to the market potential of a company. For example, hospitals occupy large areas and are located near densely populated areas, as they aim to serve the general public at large. Thus a place that satisfies the patient the higher the interest of the patient's re-visit.

4. The influence of promotion on the interest of re-visit
Partially, the promotion variable significantly influence the interest of the patient's re-visit at hospital X. If seen from positive regression coefficient, show the better promotion done by RS X then the interest of patient will also be higher. Promotion at the hospital is to let patients know about the types of services available in the hospital, how they are motivated to use, then use them on an ongoing basis and disseminate the information to their peers. Promotion is the process of communicating the marketing mix variables that are very important implemented by the company in marketing the product. The essence of promotional activities is a form of marketing communication activities that seek to disseminate information, influence, remind the target market to be willing to accept, buy, and loyal to the products offered by the company. Promotion activities of health services that exist in a hospital is growing rapidly given the increasing level of competition between hospitals. With the promotion of the better the interest of patient re-visit will increase.

5. The influence of people on the interest of re-visit
Partially, the variable of the people significantly influence the interest of patient's re-visit at hospital X. If viewed from the positive value of regression coefficient, show the better human resources in hospital X then the interest of patient visit will also be higher. People are also a vital element for the service marketing mix. This element in the marketing of services can not be separated with the customer. In a hospital or company people act as "part-time marketers" whose actions and behaviors have a direct impact on the customer's output. Therefore, service organizations that have high contact with their customers such as hospitals should clearly determine what is expected of each employee in their interactions with customers. To achieve the expected standard, recruitment, training, motivation and employee performance appraisal methods are important to improve employee quality and marketing mix [4]. With the better quality of human resources available in hospitals, it is expected that the better service, which will encourage the interest of re-visit to this hospital.

6. The influence of process on the interest of re-visit
Partially, the process variables significantly influence the interest of the patient's re-visit at hospital X. When viewed from the positive value of the regression coefficient, it shows that the better the process in hospital X then the interest of patient visit will also be higher. Process in the marketing mix is related to the production or operation process which is an important factor for high-contact services consumers who often also acts as the co-producer of the services concerned. In the service business, marketing management and operations management are closely related and hard to distinguish clearly. Elements of the process in the hospital can be seen from the process of health services take place starting from the process of registration, examination, drug taking and payment [7]. Good process in hospital for example in queue system of patient number served properly and need not wait long time, order of examination in Polyclinic not confusing patient. Nurse in doing work task with systematic and effective, and Doctor do examination on time, encourage patients to seek treatment back to this hospital.

7. The influence of physical evidence on the interest of re-visit
Partially, physical evidence variable significantly influence the interest of patient's re-visit at hospital X. If viewed from positive regression coefficient, show the better physical condition in hospital X then the interest of patient visit will also be higher. Physical evidence in the marketing mix can be a brochure featuring a building, an employee with a neat and polite appearance, an attractive internal and external decoration, a comfortable waiting room, and more. Physical evidence is important because services have intangible characteristics that cause potential customers to not judge a service before consuming it. Physical evidence will provide an overview of the characteristics of the services offered so as to reduce the level of risk perceived by customers in purchasing decisions [9].

8. The influence of customer service on the interest of re-visit
Partially customer service variables significantly influence the interest of patient re-visit at hospital X. If seen from positive value of regression coefficient, indicate that the better quality of customer service given by hospital X hence interest of patient visit also higher. Customer Service (patient service) can be interpreted as the total quality of services perceived by the customer. Therefore, the responsibility for this marketing mix element can not be isolated only in the customer service department, but should be the concern and responsibility of all production personnel of the service organization. Quality management services offered to customers are closely related to production and personnel design policies [4]. When good hospital services such as the appearance of all the hospital service personnel are attractive and presentable, the overall attitude and facial expressions are pleasant and pleasant, the officers who speak with pleasant tones and the hospital staff can explain clearly and patiently, the hope of service the satisfactory will be quickly achieved so it will encourage to re-visit.

V. CONCLUSION
1. The results of the study found that there was a significant positive influence both simultaneously and partially of product variable, price variable, place variable, promotion,
people, process, physical evidence, and customer service on the interest of the patient’s re-visit with the national health insurance in the polyclinic at hospital X.

2. Marketing mix factors in product variables have a dominant influence on the interest of patient re-visit with national health insurance in polyclinic at hospital X. It can be seen on beta value of product variable has the biggest value that is equal to 0.250 or equal to 25%.

VI. RECOMMENDATION

1. Prioritize improvements to the product, as it proves to be the dominant variable that affects the interest of repeat visits, by providing these types of services can be preventive, diagnostic, and therapeutic services and so on.

2. For the next researcher can do similar research with location and object of different research and add other marketing mix variable, so that can be obtained better result of research.

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The Role of Inconsistent Parenting and OCD in Children: A Clinical Case Study

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Abstract- The present case report highlights the role of inconsistent parenting in causation and maintenance of psychopathology of a 17 year old boy, referred here as “Anil”, diagnosed with Obsessive Compulsive Disorder. The case report also puts forward the Psychiatrist’s and the Clinical Psychologist’s reflection, focussing mostly on the treatment outcome. Pharmacotherapy and Cognitive Behaviour Therapy were the treatment of choice for Anil where Cognitive Behaviour Therapy was being modified according to the developmental needs and family context. The case report also puts forward the significance of early attachment and parenting (Guidano and Liotti, 1983, Safran, 1990) and the role they played in the development and maintenance of the dysfunctional beliefs (Bhar and Kyrios, 2000).

Index Terms- Obsessive Compulsive Disorder, Cognitive Behaviour Therapy, parenting

I. INTRODUCTION

Obsessive Compulsive Disorder (OCD) is a psychiatric condition first described more than 100 years ago (Westphahl, 1878). Obsessive Compulsive Disorder or complex repetitive rituals, isolated obsessions and compulsions might be collectively grouped into a form of a spectrum of psychological problems where the central psychological concern is the fact that adjustment might be compromised at the cost of execution of the repetitive problems/actions/rituals for the client as well as the caregivers. It might form a discrete cluster of problems associated with anxiety and impulse control.

At least one in 200 young children suffer from OCD (Flament, 1988) which might lead to disruptions in their academic, social and vocational development and functioning (Swedo, Rapoport, Leonard, Lenane M, Cheslow, 1989; Adams, Waas, March, and Smith, 1994). Between a third and half of the paediatric cases of OCD might continue to display significant symptomatology in adulthood which compromises social and vocational adjustment (Leonard, 2001).

OCD is a condition typically characterised by distressing obsessional thoughts or impulses on the one hand and compulsive rituals which help to reduce anxiety associated with the obsessions on the other. In other words, Obsessional thoughts can be thought of as exaggerations of important aspects of normal cognitive functioning (Salkovskis 1999).

Clinical features and Diagnostic Criteria---

ICD 10 criteria for Obsessive Compulsive Disorder:

The International Classification of Diseases (ICD-10) Classification of Obsessive-Compulsive Disorder (ICD-10 Code F42):--

The essential feature of this disorder is recurrent obsessional thoughts or compulsive acts. Obsessional thoughts are ideas, images or impulses that enter the individual's mind again and again in a stereotyped form, almost invariably distressing (because they are violent or obscene, or simply because they are perceived as senseless) and the sufferer often tries, unsuccessfully, to resist them. They are, recognized as the individual's own thoughts, involuntary and often repugnant.

Compulsive acts or rituals are stereotyped behaviours that are repeated again and again, not inherently enjoyable; individual often views them as preventing some objectively unlikely event, often involving harm to or caused by himself or herself. Usually, though not invariably, this behaviour is recognized by the individual as pointless or ineffectual and repeated attempts are made to resist it; in very long-standing cases, resistance may be minimal. Autonomic anxiety symptoms are often present, but distressing feelings of internal or psychic tension without obvious autonomic arousal are also common.

Obsessive-compulsive disorder is equally common in men and women, and there are often prominent anankastic features in the underlying personality. Onset is usually in childhood or early adult life. The course is variable and more likely to be chronic in the absence of significant depressive symptoms.

Diagnostic Guidelines For a definite diagnosis, obsessional symptoms or compulsive acts, or both, must be present on most days for at least 2 successive weeks and be a source of distress or interference with activities. The obsessional symptoms should have the following characteristics: (a) they must be recognized as the individual's own thoughts or impulses; (b) there must be at least one thought or act that is still resisted unsuccessfully, even though others may be present which the sufferer no longer resists; (c) the thought of carrying out the act must not in itself be pleasurable (simple relief of tension or anxiety is not regarded as pleasure in this sense); (d) the thoughts, images, or impulses must be unpleasantly repetitive.

Includes: anankastic neurosis; obsessional neurosis; obsessive-compulsive neurosis

Excludes: obsessive-compulsive personality (disorder) (F60.5)

Differential Diagnosis Differentiating between obsessive-compulsive disorder and a depressive disorder may be difficult because these two types of symptoms so frequently occur together. In an acute episode of disorder, precedence should be given to the symptoms that developed first; when both types are present but neither predominates, it is usually best to regard the
depression as primary. In chronic disorders the symptoms that most frequently persist in the absence of the other should be given priority.

Occasional panic attacks or mild phobic symptoms are no bar to the diagnosis. However, obsessional symptoms developing in the presence of schizophrenia, Tourette's syndrome, or organic mental disorder should be regarded as part of these conditions. Although obsessional thoughts and compulsive acts commonly coexist, it is useful to be able to specify one set of symptoms as predominant in some individuals, since they may respond to different treatments.

**F42.0 Predominantly Obsessional Thoughts Or Ruminations**

These may take the form of ideas, mental images, or impulses to act. They are very variable in content but nearly always distressing to the individual. Sometimes the ideas are merely futile, involving an endless and quasi-philosophical consideration of imponderable alternatives. This indecisive consideration of alternatives is an important element in much other obsessional rumination and is often associated with an inability to make trivial but necessary decisions in day-to-day living.

The relationship between obsessional ruminations and depression is particularly close: a diagnosis of obsessive-compulsive disorder should be preferred only if ruminations arise or persist in the absence of a depressive disorder.

**References:** Adapted from ICD-10: World Health Organisation. The ICD–10 Classification of Mental and Behavioural Disorders. Geneva: WHO, 1992

**Nature of the Problem:**

In the current case study Anil had checking obsessions, where he strived to be sure that he has not been responsible for harm coming to himself or others especially his mother. He also had blasphemous thoughts and religious doubts. His mental compulsions can be roughly classified as ‘restitution’ (putting right) and verification (like checking). (Salkovskis, 1985). Sometimes his behaviour was accompanied by a subjective sense of resistance to performing the compulsive behaviour. These compulsive behaviours were usually carried out in a stereotyped way or according to idiosyncratically defined “rules “and were associated with temporary anxiety relief.

**Prevalence studies:**

Studies on OCD in children revealed that OCD is much more common during adolescence than has been previously thought; it is both underdiagnosed and undertreated (Flament, 1988). Although the disorder affects individuals of all ages, the period of greatest risk is from childhood to middle adulthood (Nestadt, Romanoski, Folstein and Mc Hugh, 1994).

The prevalence rates among 4-16 year old children was 12 percent overall with 9.4 percent of children had scholastic problems (Srinath et.al., 2005). Lifetime prevalence of OCD was 0.6% (Khanna, Gururaj, 1993).

**Co morbidity studies:**

The common co-morbid disorders could be tic disorder, anxiety, depression, anorexia, bulimia, hyperkinetic disorders, developmental delays, elimination problems and schizophrenia. Between 1 and 2 percent of children have OCD. It can appear as early as 2 years of age, the most common period of onset is late childhood or early adolescence. The condition may be chronic and continuous or episodic, with one in three cases showing full recovery and one in ten having a continuous deteriorating course. OCD is distinct from the normal rituals of childhood which are prominent in the pre-school years and wane by the age of 8 or 9 years, when hobbies involving collecting and ordering selected objects, toys and trinkets take their place (Carr, 1999).

**Theoretical perspectives:**

No single theory can explain OCD. A multidisciplinary approach to understand OCD is made in the following way. The Biologicalview explains OCD as a structural problem in the basal ganglia. Serotonin hypothesis puts forward the view that OCD symptoms occur due to too rapid a re-uptake of the serotonin or abnormally low level of serotonin. The neuro-ethological theory also states that the basal ganglia and serotonin abnormalities might lead to the inappropriate release of fixed patterns of grooming or self-protective behaviour.

Psychodynamic theory explains OCD as repressed sexual-aggressive impulses associated with early parent-child conflict over toilet-training which might be displaced and substituted by less unacceptable thoughts or impulses. When these intrude into consciousness, they are experienced as ego alien because they have been disowned or isolated and might lead to cause anxiety, which is further managed by carrying out a compulsive ritual to undo or cancel out the undesirable impulse.

Cognitive-Behaviour Theory puts forth that non-threatening stimuli through being paired with anxiety-provoking stimuli, by a process of classical conditioning, come to elicit intrusive anxiety-provoking thoughts which are neutralized by engaging in compulsive rituals. Such rituals bring relief and so reinforced. Genetic factors and socialization experiences may render some people vulnerable to developing intrusive, unacceptable, obsessive thoughts.

According to Family systems theory family lifecycle transitions precipitate the onset of OCD in individuals whose socialization has rendered them vulnerable to developing obsession and compulsions. The family become involved in patterns of interaction that maintain the child’s compulsive ritualistic behaviour because of their beliefs about OCD and child care, and because symptom-maintain in patterns of interaction may meet their needs (Carr, 1999).

**Psychotherapeutic Treatment Approach:**

Abundant clinical and emerging empirical evidence suggest that cognitive-behavioural psychotherapy, alone or in combination with pharmacotherapy, is an effective treatment for OCD in children and adolescents (March, 1995).

II. CASE SUMMARY

Master “Anil” is 17 year old boy, currently pursuing a Diploma course, belonging to a middle-class Hindu nuclear family, is the only son of his parents. He was brought by his mother with the presenting complaints of difficulty in studying, repeated checking whether he would remember his lessons correctly, reassurance seeking, repeated thoughts of being punished by “God”, duration being for last 5-6 years, with...
insidious onset, continuous course, with progress improving currently. Family history revealed father and paternal grandfather with alcohol abuse and paternal grandmother of unknown psychiatric illness. Anil was sent to boarding school in Grade VIII at the age of 14 Years. However, his academic performance started deteriorating considerably from Grade VIII. He had difficulty in concentrating in his studies due to repeated thoughts about being punished by “God”. Educational history reveals his academic performance was initially above average. He did not have many friends and used to spend most of his time all by himself in school and at home. Home situation was unogenic in nature with marital discord between parents. Past psychiatric history revealed that he was under medication since 8 years of age as he used to worry about everything, repeatedly seeking reassurance and repeated checking and difficulty to complete his work during examinations. He was under psychiatric medication. Temperamentally, he did not have many friends since childhood and was not very social, had to be told about everything, lethargic, lack of motivation. Mental status examination through most of the sessions revealed appearance well kempt and tidy, eye contact maintained adequately, rapport could be established easily as attitude towards the examiner was cooperative, attention could be aroused and sustained for an appreciable period of time, speech was relevant, coherent and goal directed, adequate cognitive functions, objective affect was anxious, irritable in the initial sessions, euthymic mostly at the later sessions, thought stream, form and possession was normal, thought content revealed obsessive thoughts, compulsive covert checking, helplessness with Grade VI level of insight (Emotional Insight). On the basis of case history and mental status examination the Provisional diagnosis of Obsessive Compulsive Disorder- Predominantly Obsessional Thoughts or Ruminations was given.

Points in Favour for the above diagnosis are as follows:--

1. Repeated thoughts/ ideas, images or impulses that entered his mind again and again in a stereotyped form
2. Invariably distressing
3. Often tried, unsuccessfully, to resist them.
4. Recognized as the individual's own thoughts, even though they are involuntary and often repugnant.
5. Mental neutralizing and avoidance behavior mostly

III. INVESTIGATIONS AND ASSESSMENTS
Anil first was taken to a Psychiatrist when he was 8 years old and was under medication since then. In 2015 Anil was again referred to a school counsellor in his boarding school by the school teachers since he had difficulty in concentrating in his studies, did not interact much with other children and worried about ‘everything’. However, his condition did not improve and his mother was asked by the school principal to take him home. He was referred to a Clinical Psychologist for psychotherapy. Anil did not want to continue psychotherapy with the Psychologist after a few sessions. According to him the Psychologist did not ‘understand his problem’. He was referred to another Clinical Psychologist where he continued to attend psychotherapy. His IQ assessment was done in 2015. The IQ score was found to be 122 indicating the intellectual functioning at ‘Superior’ category. There were no other psychological reports available with the parents. The Psychotherapy sessions were continued following Cognitive Behaviour Therapy. The regular progress on the therapy sessions were measured through rating scales like Child-Yale Brown Obsessive Compulsive Disorder Scale (C-YBOCS) and Yale Brown Obsessive Compulsive Disorder Scale (Y-BOCS).The psychotherapy sessions were conducted once a week initially, with gradually once in 15 days for the follow up sessions.

IV. PSYCHOTHERAPEUTIC PROGRAM:

PSYCHOPATHOLOGY FORMULATION:

<table>
<thead>
<tr>
<th>PREDIPOSING FACTORS</th>
<th>PRECIPITATING FACTORS</th>
<th>MAINTAING FACTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal:--</td>
<td>Highly stressful events at home and at school</td>
<td>• Compulsive behaviour is maintained by anxiety-reducing efforts</td>
</tr>
<tr>
<td>• Temperamental factors like apathy, lack of responsibility,</td>
<td></td>
<td>• Anxiety being maintained by obsessional thoughts about danger associated with the stimuli</td>
</tr>
<tr>
<td>• Family history of alcohol abuse father and paternal grandfather</td>
<td></td>
<td>• Father ambivalent about resolving the problem</td>
</tr>
<tr>
<td>Contextual factors:--</td>
<td></td>
<td>• Family never coped with similar problems before</td>
</tr>
<tr>
<td>• Parent-child relationship unhealthy especially with father</td>
<td></td>
<td>Family System Factors:--</td>
</tr>
<tr>
<td>• Stress in early childhood-</td>
<td></td>
<td>• Inadvertent reinforcement of problem behavior</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>conditioning experience</th>
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<tr>
<td>Father lost job</td>
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<tr>
<td>Financial crisis</td>
</tr>
<tr>
<td>Disturbed home environment as father abused alcohol and often was responsible for fights and uncongenial family environment leading to frequent parental fights</td>
</tr>
</tbody>
</table>

**Psychological Factors:-**
- Belief that negative thoughts automatically become negative actions
- Low self-esteem
- Depressed mood
- Feeling of dejection being sent to boarding school
- Lethargy
- Lack of responsibility—has to be told about everything
- Need for aggression towards mother
- Lack of internal locus of control

**Social Network factors:-**
- Poor social network
- Child does not have peers—does not interact with other same age children
- High family stress

---

**Initial Phase:**
The initial sessions were focussed on noting the detailed clinical interview, case history, mental status examination, psychoeducating the parents as well as the child. Initial baseline assessments were conducted in order to reframe and map the obsessive thoughts and the covert compulsive behaviours. However, since Anil and his mother had previously attended psychotherapy sessions they reported that they knew about the disorder. Anil also reported that he knew about the management techniques and has learned about Exposure and Response Prevention (ERP) technique (Reddy, Sundar, Narayanaswamy and Math, 2017), before. He also reported that the technique did not help him much and he has already gone to many psychologists before so he does not have faith in psychotherapy. He also claimed that nobody would be able to ‘understand’ his distress. So the initial sessions were mostly focussed on building the rapport and rebuilding the trust in psychotherapy. Since Anil knew about ERP he was not also eager to relearn it and perform it. The initial sessions were also focussed on helping the child to make Activity Schedule followed by Mastery Pleasure daily. He was also convinced to keep a self-monitoring homework in order to help him construct a hierarchy of cues that elicit the distressing symptoms. He was also introduced to Deep Breathing relaxation technique (Carr, 1999) along with Visual Analogue Scale (VAS) (Carr, 1999) to quantify his subjective level of distress. However, Anil was not compliant to all the techniques which were given as Homework initially.

**Middle Phase:**
The habituation training as an extension of the exposure and response prevention along with thought stopping was introduced to the obsessional thoughts since Anil reported that he was unable to control his obsessional thoughts and felt helpless and these resulted in aggressive outbursts. The intrusive thoughts which are perceived by Anil as endangering his view of self, triggered an escalation in dysfunctional behaviours, or caused a more intense use of thought-control strategies (thought-suppression) (Rachman, 1997, 1998b, Rachman and Hodgson, 1980). Anil was asked for deliberate thought evocation, writing the thoughts down repeatedly and listening to a “loop tape” of the thought in his own voice. However, Anil reported that the Thought Stopping Technique and writing the thoughts helped him much more than the loop tape technique and agreed to follow the thought stopping and writing the thoughts. The avoidance and compulsive activity were almost totally covert and were therefore difficult to gain access and to control initially. Hence initially anxiety was targeted to be reduced by repeated exposure to the feared thoughts. However, it was also difficult to make the thoughts predictable since Anil reported that the thoughts were ‘automatic’ and ‘always’ ‘disturbed’ him. And also it was difficult for him to identify initially the vividness, time of onset, speed of onset, intensity, duration, rate of occurrence and the actual detailed content of the thoughts (Carr, 1999).

The Obsessive Compulsive Cognition Working Group (OCCWG, 1997, 2003) had found the exaggerated evaluation of probability and cost of aversive events (i.e. overestimation of threat) is one of the core beliefs associated with OCD. Such world perceptions stem from early attachment experiences (Guidano and Liotti, 1983). Others theories related the individual’s sense of security in the world to early attachment experiences (Ainsworth et al., 1978, Bowlby, 1973).

However, with time, Anil had gained the control on his thoughts especially with the Thought Stopping technique. He also reported that Thought Stopping Technique had helped him to keep his thoughts in his ‘control’ and reduced his discomfort. He reported that he can control his obsessional thoughts most of the time, also started learning Yoga and was preparing for his Grade X final examinations.

Apart from Mathematics, Anil passed in all the other subjects and currently pursuing a Diploma course. Several changes also took place at home. Anil’s mother separated from the father and Anil and his mother started living in a separate house. Anil was quite positive in this decision and often used to console his mother when she was upset about the separation. He also reported that he is now confident that he would be ‘successful in life’ and was not upset when he heard about failing in Mathematics.

Terminal Phase:

However, Anil is currently regularly attending the classes for the Diploma course and decided to complete his Grade Xth course from NIOS board. Anil also reported that he started his own blog where he writes poems and other write ups. He also reported that he wants to use the ‘obsessive thoughts’ which still come and distress him in the form of ‘creative writing’. Anil however, does not like to go out and make new friends and stays at home. He is being reminded about the maintaining factors like relaxation techniques and cognitive distraction techniques which he reported that he would start working on them again.

Outcome:

Graph 1: Graphical representation of the Mean Scores of ratings of subjective experience of anxiety given by Anil on a Visual Analogue Scale:
V. CLINICAL PSYCHOLOGIST’S REFLECTION

There were ambivalent attachments or insecure parent-child transactions in Anil’s family, where Anil might be uncertain of the degree to which his parents loved him or wanted. This might have led to concurrent experience of both validation and rejection and resulted in difficulties integrating opposing self-perceptions as wanted/lovable and/or unwanted or unlovable. This insecure and ambivalent self-worth further led to chronic self-monitoring and ruminations about one’s relation to others. Perfectionism and compulsive behaviours might have emerged as a means of securing approval and unifying one’s self-perceptions as a worthy and lovable person. Hence this sensitivity to the development of OC symptoms may be associated with specific parenting variables, not generally evaluated by existing parenting measures, which lead to particular perceptions of self and the environment.

Early experiences of parenting can lead to the development of a dysfunctional self-structure and world-view relevant to OCD. Therefore there is a definite role of underlying vulnerability structures in the development and maintenance of OCD-related dysfunctional beliefs and symptoms.

6 main belief domains that might have played an important role in the development of obsessions from intrusive thoughts for Anil were inflated personal responsibility, over-importance of thought, beliefs about the importance of controlling his own thoughts, overestimation of threat and intolerance for uncertainty and perfectionism. (Taylor,Kyrios, Thordarson, Steketee and Frost, 2002). Hence, perceived parent-child interactions can be linked with anxiety difficulties(Arrindell,Emmelkamp andMonsma, ,1983). Studies by Ehiohube,1988 found individuals with obsessions had reported their parents as rejecting, more overprotective, and less emotionally warm compared to individuals with low obsessional scores. Anil experienced confusing and ambivalent patterns of attachments with his parents which increased the risk for the development of obsessional problems in him(Guidano and Liotti,1983).

The self-perceptions were influenced by his early experiences and attachment with the parents, where impaired early child-parent interactions led to the development of impaired representations of the self and the world that hampered the later assimilation of new experiences into self-knowledge. These dysfunctional representations resulted in stereotyped and repetitious interactions with reality. Parental variables lead to Anil’s over-reliance of certain aspects of self (ie self-concept comprising relatively few domains that were sensitive) coincided with the belief that the worlds are controllable but threatening. might be unique to OCD. (Giodano and Liotti,1983).

The therapy sessions were mostly targeted with the aim of invalidating the expectations and/or beliefs about the negative thoughts becoming negative actions. Previous results indicate that children with early-onset OCD benefit from a treatment approach tailored to their developmental needs and family context (Garcia, Freeman, Himle et al., 2009).Keeping in mind the developmental differences, in case of Anil, the traditional adult CBT approaches were modified, including age-appropriate techniques to address the family involvement and the impact of the psychosocial functioning (Piacentini and Langley,2004).

Anil from a very early age might have learned to become a “super-child” trying to be responsible for helping his mother to take care of the house, taking care of his father, often might be feeling guilty over his inability to “save” his father, despite repeated efforts. This inability might have led to a sense of poor self-image and difficulty in maintaining interpersonal relationships especially with people other than mother. Father’s alcoholism, disturbed the interpersonal relationship between his parents, which might also have led to some “psychological scars” that manifested in the form of obsessive-compulsive disorder and an unrealistic need to be “perfect”, in him. Therefore the constant searching for approval from others as well as self can also be related from the above mentioned facts (Gold,2016).Along with
the role of mothers, the role of fathers are also important for the
development, prevention, and treatment of anxiety and anxiety
disorders in children and adolescents Bogels and Phares2008). As
stated in earlier studies, at least 57% of children and adolescents
who were diagnosed with OCD, had some first-degree relative
with a psychiatric diagnosis along with family conflicts, social
withdrawal and poor school performance (Toro, Cervera, Osejo

Anil’s father was ‘belligerent type’ of alcoholic who used
to verbally abuse and argued with Anil’s mother and Anil. Hence
Anil was the recipient of the verbal and emotional abuse from his
father. Corroborating with the past literature it can also be
pointed out that since father’s effect on child’s externalizing and
internalizing problems are immense (Phares and Compas 1992).
Anil’s psychopathology can also be associated
with his father’s characteristics as mentioned by his mother. Anil
might have also learned the way his father used to manifest his
anger by hitting self or others or throwing things.

However, Anil’s father was also highly passive alcoholic at
times (Ackerman, 1991). This inconsistency in parenting led to a
crisis situation for Anil and his mother. It was a daily struggle
for them to survive a situation while denying the existence of the
father. Anil being torn between the parents at times he seemed
loyal to his mother and at the same time feeling the anger for
father as being deprived of the emotional and physical support
from the father. This also might have been one reason to avoid
peer activities outside home out of fear or shame and also
learning some maladaptive ways of dealing with the negative
emotional state. The sense of self-worth also was affected.
However, Anil’s father was also aware of the emotional hazards
he was causing for Anil as he expressed his concern about not
being able to meet the emotional needs of Anil.

Another thought can be put forward— Anil also
experienced ‘emotional separation’ from the parents being sent
to boarding school, often might be feeling rejected by parents.
The lack of ‘emotional security’ might have prohibited Anil from
intimate friendship/relationship. There was also inconsistency in
the parenting.

Anil’s mother always tried and attempted to fulfil the
needs of her child, was also under constant pressure to protect
her child from becoming like his father. She also tried to fulfil
two roles both financially and emotionally. Hence there were
times, where there were too much of concern and at the same
time too little. Mother also became too protective about Anil.
This protection was at times misunderstood by Anil leading to
anger outbursts from him towards his mother. Anil was also
forced into increased responsibilities and unfamiliar roles. The
therapy sessions might have given him the path for acquiring and
regaining a sense of trust in his parent especially mother as well
as himself leading to acquisition of self-awareness and positive
self-esteem. Some sense of security has also developed in him,
and currently he has the goal to grow while accepting the
circumstances and feeling good about himself.

VI. PSYCHIATRIST’S REFLECTION

Anil is a 17 year old boy from a middle socio economic
status family residing in a major metropolitan city in India. His
temperament is described as being difficult with elements of
moodiness, stubborn-ness and lack of motivation. At the time of
first evaluation he was living with both parents. Mother fulfilled
criteria for depression while father fulfilled criteria for alcohol
and nicotine dependence syndrome with significant narcissistic
traits. Marital discord, inconsistent parenting and financial
difficulties were present. It appeared that mother was primary
caretaker with father rarely participating in the patient’s
upbringing. Mental status examination revealed obsessions,
compulsions and magical thinking with partial insight.

Anil had been assessed by a number of Psychiatrists and
been on medication and therapy since the age of 8 years. He was
on venlafaxine 75mg twice daily, Fluvoxamine 100mg twice
daily, risperidone 2 mg twice daily, trihexyphenidyl 2mg daily
and clonazepam 0.25mg twice daily. These medicines were
reported to be giving a good response with minimal side effects
(primarily dry mouth). Hence the same medication was
continued and it was planned to focus on individual therapy and
caregiving while he remained stable on medication. Anil’s follow up was regular and punctual. His compliance was
adequate. He made satisfactory progress and continued regular
therapy. He had been correctly diagnosed and had been on
medication since several years. Addition of therapy helped to
overcome the treatment resistant symptoms and provide good
outcome.

VII. CONCLUSION

Based on Attachment theory the way Anil developed a
sense of security based on the perception of having a secure-base
to return to in case of need. This sense of security reflected his
experience of being nurtured (ie perceived degree of feeling
loved by the main caregiver and perceived degree of availability
and responsiveness of the main caregiver that is his mother. This
might have influenced Anil’s perceptions of the world and of
human nature (Bretherton and Munholland, 1999).

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Abstract- Mobile application development is one of the recent trends in computing Industry. Android is one of the largest platforms around the world that run in several smart phones and tablets from various manufacturers like Google, Motorola, Samsung, HTC etc. This paper aims to develop a board game for android platform, exploring a new dimension in the traditional board game to make it more interesting and challenging. It brings fun and simplicity of ‘Tigers and Goats’ game with new features. It includes computer controlled intelligent opponents whose aim is to challenge the human player. ‘Tigers and Goats’, is a simple game application in android targeting people to teach how to make correct and usable models in a relatively short amount of time. The application presents a graphical user interface with triangle shaped game board and invisible buttons on the game positions. The application allows the user to place pieces on game positions by touching on it. The user’s goal is to take out ten goats or tied down all tigers. The application contains two-player mode and single-player mode. The game itself is core strategy. It requires a fair understanding of the principles of attack, defense, and teamwork, and is suitable for players of the ages six and up. While it takes just a few minutes to learn, it can take ages to master. This will be a challenging game, and will test your strategy skills.

Index Terms -Android, Board Game, Game Application, Graphical User Interface.

I. INTRODUCTION

One of the most widely used mobile OS these days is ‘Android’. Android was founded in Palo Alto of California by Andy Rubin, Rich miner, Nick sears and Chris White in 2003. Later Android Inc. was acquired by Google in 2005. Over the years, there have been multiple versions released each with its own name. Since the initial release of the Android operating system, there have been more than 14 versions released up until the latest version, 7.0 Nougat. Each major version of Android has a dessert-based nickname, and they are all in alphabetical order.

Initially, the deployment target for Android was the mobile-phone arena, including smart phones and lower-cost flip-phone devices. However, Android’s full range of computing services and rich functional support has the potential to extend beyond the mobile-phone market. Android can be useful for other platforms and applications. Android applications are written in java programming language, which is open source software and the Android SDK is available to developers free.

Nowadays people are interested in playing games on their mobile devices, especially when they travel a distance. One of the most interesting type of game is ‘Tigers and Goats’ is a board game for Android based smart phones, which gives enjoyment and helps increasing the player’s strategy skills. ‘Tigers and Goats’ is a strategic, two-player board game that originates in South India named as Aduhuli. This game between two opponents, whom we call “Tiger” and “Goat”, is asymmetric game in that one-player controls three tigers and the other player controls up to fifteen goats.

As said above, the proposed application is an Android strategy game targeting people who wish to learn to play board games on mobile devices and making correct moves to win. The intention is also to popularize this traditional game as an Android app, in order to recall our traditional game being played by younger generation for long time. Android is chosen because of its wider popularity among mobile-phone users.

II. TIGERS AND GOATS GAME

Tigers and Goats (Aduhuli) is a strategic, two-player board game that originates in South India. The game is asymmetric in that one player controls three tigers and the other player controls up to fifteen goats. The tigers ‘hunt’ the goats while the goats attempt to block the tigers’ movements. This game is also seen in Nepal with different board but the rules are same. The game is played on a five by five-point grid or triangle shaped board. Pieces are positioned at the intersection of the lines and not inside the areas delimited by them. Directions of valid movement between these points are connected by lines.

The game play takes place in two phases. In the first phase, the goats are placed on the board while the tigers are moved. In the second phase both the goats and the tigers are moved. For the tigers, the objective is to ‘capture’ ten goats to win. Capturing is performed by jumping over the goats, although capturing is not obligatory. The goats win by blocking all the tigers’ legal moves. It has many similarities to the Nepal game Bagh Chal (goat-tiger game), though the board is different.

A. Rules of the Game

At the start of the game all three tigers and all goats are start off the board. The pieces must be put at the intersections of the board lines and moves follow the lines. Tigers play first. In a placement phase, tigers place one on each move, on any empty spot. After each placement of a tiger, a goat will be placed. After the placement of three tigers, tiger-player moves one of his/her tigers according to either of the following two rules:

1) A tiger can slide from his current spot to any empty spot that is adjacent and connected by a line; or

2) A tiger may jump in a straight line over any single adjacent goat, thereby killing the goat (i.e., removing the goat from
the board), provided that the landing spot next to the goat is empty.

Figure 1. Initial game position of Tigers and Goats

Figure 2. After the placement of three tigers

If tigers have no legal move, tiger-player loses the game (see Figure 3); if a certain number of goats have been killed (typically ten), goat-player loses. If neither of these conditions ever arises, the outcome is a draw by repetition.

If老虎和山羊的摆放位置之一为山羊（见图3），如果虎方没有合法的走法，虎方输。如果一定数量的山羊被杀死（通常是十只），则羊方输。如果这两种情况都不发生，结果将是重复的。

B. Game features
1) Play Tigers or Goats in the single player mode against the Android device (Human-Android or Android-Human).
2) Player can choose role to play (Tiger/Goat).
3) Two players can also play against each other on the same Android device (Human-Human).

C. GUI Design
This application was implemented on eclipse using Java and XML, and also developed using Android 4.0 - API level 14(Ice Cream Sandwich), because of its support for Grid Layout and Drop Down actions. This application is compatible with devices running API level 14 and higher versions. Random moves and onClick event are used to find the location for the tiger’s, goat’s placement and moves.

Figure 4. Name of the board positions to place the pieces

Figure 3. Tiger player loses the game

After the placement of all goats (and tigers have already been placed now), goat-player has to move on his/her turn to play, goat-player must slide any of surviving goats to an adjacent empty spot connected by a line. If there are 10 or fewer goats on the board, three tigers cannot have blocked by all goats and a move for tigers is always exists. In exceptional cases, which arise only if goats cooperate with tigers, the three tigers can surround twelve or more goats in a corner and prevent any goat moves. In such rare scenario where goats have no legal moves, goats lose the game.
III. ALGORITHM

The game board consists of 23 spots named as B0 to B22. Human player can choose a role as tiger/goat. Assume that the human player is playing goat as G and the Android is playing tiger as T.

A. Check for winning condition

At the start of its turn, the Android first checks for tiger's winning cases and goat's winning cases. For the tiger's winning, the number of G in the board is less than or equal to five. For the goat's winning, the moves for all three T are null.

Algorithm:

Let B[i] be the ith spot. So I lies between 0 and 22. Let numerically T be represented by 0 and G by 1 and empty spot by 2.

value = 0

For (int i=0; i<22; i++) {
    //Tiger blocked in spot i
    if (i==0) {
            value=value+1
        }
    }
    if (i==1) {
        if (B[i] == 0 && B[i+1] == 1 && B[i+2] == 1 && B[i+6] == 1) {
            value=value+1
        }
    }
    if (i==2) {
            value=value+1
        }
    }
    if (i==3 || i==4) {
            value=value+1
        }
    }
    if (i==5) {
            value=value+1
        }
    }
    if (i==6) {
        if (B[i] == 0 && B[i-1] == 1 && B[i+2] == 1 && B[i+6] == 1) {
            value=value+1
        }
    }
    if (i==7) {
            value=value+1
        }
    }
    if (i==8) {
        //Tiger blocked in spot B8
        if (B[i] == 0 && B[i+1] == 1 && B[i-1] == 1 && B[i+6] == 1) {
            value=value+1
        }
    }
    if (i==9 || i==10) {
        //Tiger blocked in spot B9 or B10
        if (B[i] == 0 && B[i-1] == 1 && B[i-2] == 1 && B[i+6] == 1) {
            value=value+1
        }
    }
    if (i==11) {
        //Tiger blocked in spot B11
        if (B[i] == 0 && B[i-1] == 1 && B[i+1] == 1) {
            value=value+1
        }
    }
    if (i==12) {
        //Tiger blocked in spot B12
        if (B[i] == 0 && B[i+6] == 1 && B[i-1] == 1) {
            value=value+1
        }
    }
    if (i==13) {
        //Tiger blocked in spot B13
        if (B[i] == 0 && B[i+1] == 1 && B[i+2] == 1 && B[i+5] == 1) {
            value=value+1
        }
    }
    if (i==14) {
        //Tiger blocked in spot B14
        if (B[i] == 0 && B[i-1] == 1 && B[i-2] == 1 && B[i+6] == 1) {
            value=value+1
        }
    }
    if (i==15 || i==16) {
        //Tiger blocked in spot B15 or B16
        if (B[i] == 0 && B[i-1] == 1 && B[i-2] == 1 && B[i+5] == 1) {
            value=value+1
        }
    }
    if (i==17) {
        //Tiger blocked in spot B17
        if (B[i] == 0 && B[i-1] == 1 && B[i+5] == 1) {
            value=value+1
        }
    }
    if (i==18) {
        //Tiger blocked in spot B18
        if (B[i] == 0 && B[i-1] == 1 && B[i-6] == 1) {
            value=value+1
        }
    }
    //Goat's winning condition
    if (i==1) {
            value=value+1
        }
    }
    if (i==2) {
        if (B[i] == 1 && B[i+1] == 1 && B[i+2] == 1) {
            value=value+1
        }
    }
    if (i==3 || i==4) {
        if (B[i] == 1 && B[i+1] == 1 && B[i-1] == 1 && B[i+2] == 1) {
            value=value+1
        }
    }
    if (i==5) {
        if (B[i] == 1 && B[i-1] == 1) {
            value=value+1
        }
    }
    if (i==6) {
        if (B[i] == 1 && B[i-1] == 1) {
            value=value+1
        }
    }
    if (i==7) {
        if (B[i] == 1 && B[i-1] == 1) {
            value=value+1
        }
    }
}

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If (i==19) { //Tiger blocked in spot B19
        value=value+1
    }
}

If (i==20) { //Tiger blocked in spot B20
        value=value+1
    }
}

If (i==21) { //Tiger blocked in spot B21
        value=value+1
    }
}

If (i==22) { //Tiger blocked in spot B22
    If(B[i] == 0 && B[i-1] == 1 && B[i-2] == 1 && B[i-5] == 1) {
        value=value+1
    }
}

B. Playing for Defensive

Whenever the Android detects an empty spot which is followed by T, G it may insert T in the empty spot or capture the G to prevent the blocking from G.

C. Moves for Winning

First, it is obvious that the goats have to consider the border during the placement phase - any goat that strays into the center will get eaten, or cause the demise of some other goat, without any apparent benefit in return for the sacrifice. Therefore, goat-player strategy sounds simple: first populate the borders, and when at full strength, try to advance in unbroken formation, in the hope of suffocating the tigers.

Second, tiger is moving back and forth, until near the end of the placement phase. Their goal is to stay far apart from each other, for two reasons: (1) in order to probe the full length of the goats’ front line for gaps, (2) so as to make it hard for the goats to immobilize all the three tigers at the same time.

D. Capture the Goats

For the tigers, the objective is to ‘capture’ ten goats to win. Capturing is performed by jumping over the goats, although capturing is not obligatory. There are possible cases to capture the goat.

Algorithm:
Let B[i] be the i-th spot. So i lies between 0 and 22. Let numerically T be represented by 0 and G by 1 and empty spot by 2.

If (i==0 || B[i]==0) {
    If(B[i+2] == 1 && B[i+3] == 2) {
        B[i]=2, B[i+2] =2, B[i+3] =0
    }
    If (B[i+6] == 1 && B[i+12] == 2) {
        B[i]=2, B[i+6] =2, B[i+12] =0
    }
}

If (i==1 || i==2 && B[i]==0) {
    If(B[i+1] == 1 && B[i+2] == 2) {
        B[i]=2, B[i+1] =2, B[i+2] =0
    }
    If (B[i+6] == 1 && B[i+12] == 2) {
        B[i]=2, B[i+6] =2, B[i+12] =0
    }
}

If (i==3 || i==4 && B[i]==0) {
    If(B[i+1] == 1 && B[i+2] == 2) {
        B[i]=2, B[i+1] =2, B[i+2] =0
    }
    If (B[i-1] == 1 && B[i-2] == 2) {
        B[i]=2, B[i-1] =2, B[i-2] =0
    }
}

If (i==5 || i==6 && B[i]==0) {
    If(B[i-1] == 1 && B[i-2] == 2) {
        B[i]=2, B[i-1] =2, B[i-2] =0
    }
    If (B[i+6] == 1 && B[i+12] == 2) {
        B[i]=2, B[i+6] =2, B[i+12] =0
    }
}

If (i==7 || i==8 && B[i]==0) {
    If(B[i+1] == 1 && B[i+2] == 2) {
        B[i]=2, B[i+1] =2, B[i+2] =0
    }
    If (B[i-1] == 1 && B[i-2] == 2) {
        B[i]=2, B[i-1] =2, B[i-2] =0
    }
}
If \( i==9 \) || \( i==10 \) && \( B[i]==0 \) {
    If \( B[i+1] == 1 \) && \( B[i+2] == 2 \) {
        \( B[i]=2, B[i+1]=2, B[i+2]=0 \)
    }
    If \( B[i-1] == 1 \) && \( B[i-2] == 2 \) {
        \( B[i]=2, B[i-1]=2, B[i-2]=0 \)
    }
    If \( B[i+6] == 1 \) && \( B[i+11] == 2 \) {
        \( B[i]=2, B[i+6]=2, B[i+11]=0 \)
    }
    If \( B[i-6] == 1 \) && \( B[i-11] == 2 \) {
        \( B[i]=2, B[i-6]=2, B[i-11]=0 \)
    }
}

If \( i==11 \) && \( B[i]==0 \) {
    If \( B[i-1] == 1 \) && \( B[i-2] == 2 \) {
        \( B[i]=2, B[i+1]=2, B[i+2]=0 \)
    }
    If \( B[i+6] == 1 \) && \( B[i+11] == 2 \) {
        \( B[i]=2, B[i+6]=2, B[i+11]=0 \)
    }
    If \( B[i-6] == 1 \) && \( B[i-11] == 2 \) {
        \( B[i]=2, B[i-6]=2, B[i-11]=0 \)
    }
}

If \( i==12 \) && \( B[i]==0 \) {
    If \( B[i-1] == 1 \) && \( B[i-2] == 2 \) {
        \( B[i]=2, B[i-1]=2, B[i-2]=0 \)
    }
    If \( B[i-6] == 1 \) && \( B[i-12] == 2 \) {
        \( B[i]=2, B[i-6]=2, B[i-12]=0 \)
    }
}

If \( i==13 \) || \( i==14 \) && \( B[i]==0 \) {
    If \( B[i+1] == 1 \) && \( B[i+2] == 2 \) {
        \( B[i]=2, B[i+1]=2, B[i+2]=0 \)
    }
    If \( B[i-6] == 1 \) && \( B[i-12] == 2 \) {
        \( B[i]=2, B[i-6]=2, B[i-12]=0 \)
    }
    If \( B[i-1] == 1 \) && \( B[i-2] == 2 \) {
        \( B[i]=2, B[i-1]=2, B[i-2]=0 \)
    }
}

If \( i==15 \) || \( i==16 \) && \( B[i]==0 \) {
    If \( B[i+1] == 1 \) && \( B[i+2] == 2 \) {
        \( B[i]=2, B[i+1]=2, B[i+2]=0 \)
    }
    If \( B[i-6] == 1 \) && \( B[i-12] == 2 \) {
        \( B[i]=2, B[i-6]=2, B[i-12]=0 \)
    }
    If \( B[i-1] == 1 \) && \( B[i-2] == 2 \) {
        \( B[i]=2, B[i-1]=2, B[i-2]=0 \)
    }
}

If \( i==17 \) || \( i==18 \) && \( B[i]==0 \) {
    If \( B[i+1] == 1 \) && \( B[i+2] == 2 \) {
        \( B[i]=2, B[i+1]=2, B[i+2]=0 \)
    }
    If \( B[i-6] == 1 \) && \( B[i-12] == 2 \) {
        \( B[i]=2, B[i-6]=2, B[i-12]=0 \)
    }
}

If \( i==19 \) || \( i==20 \) && \( B[i]==0 \) {
    If \( B[i+1] == 1 \) && \( B[i+2] == 2 \) {
        \( B[i]=2, B[i+1]=2, B[i+2]=0 \)
    }
    If \( B[i-5] == 1 \) && \( B[i-11] == 2 \) {
        \( B[i]=2, B[i-5]=2, B[i-11]=0 \)
    }
    If \( i==21 \) || \( i==22 \) && \( B[i]==0 \) {
        \( B[i]=2, B[i-5]=2, B[i-11]=0 \)
    }
}

If \( i==23 \) || \( i==24 \) && \( B[i]==0 \) {
    If \( B[i+1] == 1 \) && \( B[i+2] == 2 \) {
        \( B[i]=2, B[i+1]=2, B[i+2]=0 \)
    }
    If \( B[i-5] == 1 \) && \( B[i-11] == 2 \) {
        \( B[i]=2, B[i-5]=2, B[i-11]=0 \)
    }
    If \( B[i-1] == 1 \) && \( B[i-2] == 2 \) {
        \( B[i]=2, B[i-1]=2, B[i-2]=0 \)
    }
}

IV. Conclusion

I expect this paper will grab the attention of a much wider body of traditional game researchers and that it will inspire others to play this fascinating game. Certainly, with time, new updates and modifications to the algorithm shall definitely improve the gameplay. But as we have seen, that fuzzy logic and making decisions based on multiple conditional cases has definitely a strong advantage over hard computing techniques and thus, soft computing is widely used in implementing the functionalities of various game engines used worldwide.

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AUTHORS

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Psychosocial Morbidities: A rising trend in breast cancer patients. An explorative study in an Indian setting

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Abstract- AIM: The present study was aimed to assess psychiatric morbidity among post mastectomy patients attending cancer OPD in a tertiary care centre in Northern India.

METHODS: A descriptive non experimental research design was used to conduct the cross-sectional survey in 50 patients. All patients who were diagnosed of breast cancer and were post-mastectomy patients were scheduled for an interview based on SCL-80 tool to analyze body image disturbance and the incidence of psychosocial abnormalities.

RESULTS: More than 60% of the study subjects had partially whereas 18% patients had fully disturbed body image as assessed by the SCL-80 protocol. Anger hostility and phobic anxiety were found to be strongly related to higher stages of breast cancer with p-value < 0.5. Other criterias like depression, anxiety and somatization although not statistically significant but demonstrated a rise in incidence with stage II followed by a slight decrease in stage III. Other morbidities included were moderate somatization in 28% patients, interpersonal sensitivity in 68% patients whereas anger ranging from severe to mild form was seen in 66%.

CONCLUSION: This study emphasized the importance for initiating mental health services from a professional point of view in early phase of treatment in order to enhance the quality of life and to increase compliance towards treatment.

Index Terms- body image, breast cancer, post mastectomy, psychiatric morbidity

I. INTRODUCTION

For several serious reasons, breast cancer is especially important among women malignancies. According to Parkins DM et al, the breast cancer pivotal aspects include having a high prevalence and being the second cause of cancer death among women (1). Ferlay J, affirmed that breast cancer is by far the most frequent cancer among women with an estimated 1.38 million new cancer cases diagnosed in 2008 (23% of all cancers), and ranks second overall (10.9% of all cancers). It is now the most common cancer both in developed and developing regions with 690,000 new cases estimated in each region (population ratio 1:4 (2). In India, Saxena et al confirmed that the mean age of diagnosis of breast cancer was 47.8 years, average being 13-82 years of patients. Breast cancer has specific challenges for women due to its impact as a life threatening disease, its intensive surgical and medical treatments, and also changes in sexuality, femininity, body image and maternal issues after mastectomy (3). According to Glanz et al, women may face psychiatric co-morbidity with this new life situation (4). In an observation by Oktay JS, over the past 20 years, an increase in the number of survivors due to the advances in treatment and early detection, scientific attention has turned to considerations of the patients' quality of life and their psychological functioning during and after treatment, rather than solely to the issues of disease-free and overall survival (5). Many researchers including Devita VT and colleagues have reported that six mental disorders occur more frequently in cancer patients to warrant a detailed assessment and clinical intervention. Three represent direct reaction to illness; adjustment disorder, major depression and delirium while the others, primarily anxiety disorders, personality disorders and major depressive illness are pre-existing conditions often exacerbated by the illness (7). It has been seen in different studies by Bloom JR(2001), Coates A(1990) and Omne-Ponten M (1992) that demographic factors such as age, and marital status and biological variables such as disease stage, type of treatment and surgical removal of the breast may affect the patients’ psychological symptoms. (8,9,10) Due to small number of studies in this field and some specific aspects of breast cancer operational in the North-Western part of India such as younger age of presentation, advanced stage at presentation and different cultural background of patients, we conducted this study to investigate the frequency of various psychosocial morbidities resulting during the course of treatment of breast cancer.

Materials and Methods:

A descriptive non experimental research study was conducted at the department of Radiotherapy and Oncology at Guru Gobind Singh Medical College & Hospital Faridkot, Punjab in 2016. The patients (n=50) were biopsy proven cases of breast cancer. All patients from stage I to stage III were included in the study. The follow-up period ranged from three to eight months. The purpose and contents of the study were explained to the patients in detail and after obtaining a written consent, demographic information including age, age at onset of disease, marital status, education, number of children, and past medical history were collected through a personal interview.

The stage of disease, lymph nodes involved, histological grade, tumor size and type of surgery either modified radical mastectomy or breast conservative surgery (MRM/BCS) along

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with other such biological factors were derived from the patients’ records. To eliminate any bias in selection, the patients’ with specific life events in the preceding year such as bereavement, those with any psychotic illness or substance abuse, age over 70 years at the time of study, any other chronic illness, (e.g. irritable bowel disease, thyroid disease, hypertension etc.) or cancer were excluded.

Convenient sampling technique was used to assess body image and psychiatric morbidity. An interview schedule was carried out by using self structured body image scale to assess body image disturbances and SCL-80 tool for psychiatric morbidity among patients. The method consisted a series of scheduled interviews in which the role of the interviewer was to facilitate the free speech in women, making possible the unrestricted communication of their illness experience at its different stages. The SCL-80 tool is attached in the appendix. The sociodemographic data like age, sex, income of the family, residence and type of family was recorded in a semi structured method. The categories of coding procedures were formed as body image and psychosocial concerns, anxiety features and distress, depressive symptoms and coping strategies. Responses of the patients were analyzed using content analysis. After screening the patients who were found to have positive psychological stress, a follow-up interview was scheduled and those needing specialist care were referred to the psychiatry department.

II. RESULTS AND ANALYSIS
1. A total of 50 patients were enrolled in our study. Their age at the time of study varied from 26 years to 65 years. The most common age-group was 46 to 55 years (32%) followed by (30%) in the age group of 56 to 65 years and the minimum were in 26 to 35 years (8%) age group.
2. The majority of patients were illiterate or primary school pass 21 (42%), followed by middle school or intermediate pass 18(36%), and very few had completed post graduation studies 11 (22%).
3. Forty five patients (90%) were married and five patients (10%) were unmarried.
4. In the study, 21 patients (40.3%) were advanced cancer patients suffering from stage III, whereas 18 (34.6%) were stage II and 13 patients (25%) were stage I. (Figure 1)
5. SCL-80 Tool was used scores are shown in the separate table (Table 2). It indicates the number and percentage of patient responses regarding body image and psychosocial concerns. From the table it is evident that the major concerns of the patients who are undergoing mastectomy and subsequent treatments were about their body image. (Table 1) The study revealed that more than 60% of the study subjects had partially and 18% had fully disturbed body image as assessed by the SCL-80 protocol. Moderate depression was seen in 22% of patients.
6. Generalised anxiety disorder was seen 66% of patients. Other psychiatric morbidities observed were moderate somatization in 28%, interpersonal sensitivity 68% whereas anger ranging from severe to mild form was seen in 66%. During the study 48% patients opted for breast reconstruction.
7. We tried to establish a correlation between different stages of presentation with various components of this psychological study. And it was observed that all the components were more commonly observed in stage III as compared in stage I and stage II.
8. Depression: Grade II was seen as the most common grade 26 (52%) patients amongst all stages. Whereas about 11(22%) patients showed evidence of grade 3 depression and were started on appropriate medication. Correlation between various grades of depression and stages of disease were however nonsignificant.
9. Anxiety: Majority of the patients belonged to the grade 2 anxiety group 23 (46%) patients, followed by grade 1 in 17 (34%) patients and grade 3 in 10 (5%) patients. However , nothing was proved statistically significant.
10. Somatization: Majority of the patients 26 (52%) showed grade II somatization and mostly were in stage III. It was followed by 13 (26%) patients in grade I. Grade III somatization was found in 11(22%) patients. There was no statistically significant correlation found to be associated between somatization and clinical staging.
11. Phobic Anxiety: Most common grade of phobic anxiety observed in breast cancer patients were grade II. It was seen in about 35 (70%) patients. It was followed by grade I seen in 13 (26%) patients. However, grade 3 and 4 were seen only in 1 patient each. Stage II disease showed a statistically significant correlation with phobic anxiety with a p-value of 0.01. Similarly stage III was also tested for any significance in relation with phobic anxiety and it was found to be highly significant with p-value of <0.001.
12. Anger Hostility: majority of the patients 30 (60%) were reported to have grade II anger hostility. It was followed by grade I in 17(34%) patients. Grade III and grade IV had one and two patients respectively. Statistical analysis highlighted that stage II and stage III had highly significant correlation with anger hostility with p-values of 0.006 and 0.008 respectively.
13. The eagerness for a complete body was evident with number of patients who opted for breast reconstruction. Out of the total 50 patients about 24 (48%) wanted to undergo breast reconstruction which was statistically significant with a p-value of 0.027. Amongst the various age-groups the majority who opted for breast reconstruction were between 36-45 years emphasizing the younger population favoring the surgery.
Table 1: Breast cancer patients’ demographic variables.

<table>
<thead>
<tr>
<th>Demographic Variables</th>
<th>Patients (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, years (Mean±SD)</td>
<td>48.6(9.16)</td>
</tr>
<tr>
<td>Educational level (%)</td>
<td>21(42%)</td>
</tr>
<tr>
<td>Primary education or illiterate</td>
<td>18(36%)</td>
</tr>
<tr>
<td>Intermediate</td>
<td></td>
</tr>
<tr>
<td>High school or post graduate</td>
<td>11(22%)</td>
</tr>
<tr>
<td>Marital status (%)</td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>45(90%)</td>
</tr>
<tr>
<td>Single</td>
<td>5(10%)</td>
</tr>
</tbody>
</table>

Table 2. Distribution of various clinical variables and their correlation.

<table>
<thead>
<tr>
<th>Clinical Variables</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>12(24%)</td>
</tr>
<tr>
<td>II</td>
<td>18(36%)</td>
</tr>
<tr>
<td>II</td>
<td>20(40%)</td>
</tr>
<tr>
<td>Missing</td>
<td>None</td>
</tr>
<tr>
<td>Type of Operation</td>
<td></td>
</tr>
<tr>
<td>MRM</td>
<td>38(76%)</td>
</tr>
<tr>
<td>BCS</td>
<td>12(24%)</td>
</tr>
<tr>
<td>Histological Grade</td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>12(24%)</td>
</tr>
<tr>
<td>II</td>
<td>25(50%)</td>
</tr>
<tr>
<td>III</td>
<td>4(8%)</td>
</tr>
<tr>
<td>Missing</td>
<td>9(18%)</td>
</tr>
</tbody>
</table>
Table 3. Statistical correlation of different clinical variables and stage of disease presentation.

<table>
<thead>
<tr>
<th></th>
<th>Stages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I (13)</td>
</tr>
<tr>
<td>Depression</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Chi Square</td>
<td>2.932</td>
</tr>
<tr>
<td>P value</td>
<td>0.232</td>
</tr>
<tr>
<td>Sig.</td>
<td>NS</td>
</tr>
<tr>
<td>Anxiety</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Chi Square</td>
<td>2.932</td>
</tr>
<tr>
<td>P value</td>
<td>0.232</td>
</tr>
<tr>
<td>Sig.</td>
<td>NS</td>
</tr>
<tr>
<td>Somatization</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Chi Square</td>
<td>2.000</td>
</tr>
<tr>
<td>P value</td>
<td>0.368</td>
</tr>
<tr>
<td>Sig.</td>
<td>NS</td>
</tr>
<tr>
<td>phobic anxiety</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Chi Square</td>
<td>0.077</td>
</tr>
<tr>
<td>P value</td>
<td>0.782</td>
</tr>
<tr>
<td>Sig.</td>
<td>NS</td>
</tr>
<tr>
<td>anger hostility</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Chi Square</td>
<td>3.846</td>
</tr>
<tr>
<td>P value</td>
<td>0.146</td>
</tr>
<tr>
<td>Sig.</td>
<td>NS</td>
</tr>
</tbody>
</table>

III. DISCUSSION

In our study, majority of patients (32%) belonged to 46-55 years of age, which is slightly lower than the age reported in earlier studies, for eg, by K McPherson et al, which stated that the incidence is increasing particularly among women aged 50-64, probably because of breast screening in this age group.(11) It was the age specific incidence rates increase rapidly with age until about 45-50 years, after which they continue to increase but at a slower rate. (12) In the present study, no significant correlation was found in prevalence rate of psychiatric disorders and the occupation of the patients as most of the patients were housewives, however, Ogce F et al in 2007, found out that unemployed breast cancer patients significantly had more psychological distress than employed patients. (13) Simpson JSA et al in 2002, in their study on breast cancer patients found that there was clear evidence of a cross-sectional relationship between social support and psychiatric morbidity at each time point, as those women with DSM-IIIR diagnosis had significantly less social support.(14) In our study, no significant correlation was found in prevalence rate of psychiatric disorders and the marital status of the patients, it could be due to the constitution of the sample as our study had 97% of married participants.

It was affirmed by Burgess C and colleagues that lack of intimate confiding support also predicted more protracted episodes of depression and anxiety.(15) Ogce F et al also supported the idea, with their observation on Turkish breast cancer patients that the women with high social support scores had assistance provided by family, a special person or a friend. (13). These women had low psychiatric morbidity as compared to women with no support. In our study patients living in nuclear families had more psychiatric morbidity due to lack of intimate confiding support which was similar in above mentioned studies.

In the study done by Shandilya et al in 2015 it was observed that 45% patients met DSM IV criteria for diagnosis of psychiatric disorders 16(59.25%) patients were of Adjustment Disorder, 6(22.22%) of Major Depressive Disorder, 4(14.8%)
patients of Generalised Anxiety Disorder and 1(3.7%) patient of Somatoform Pain Disorder(17). Similar findings were revealed in the present study that more than 60% of the study subjects had partially and 18% had fully disturbed body image as assessed by the SCL-80 protocol. Moderate depression was seen in 22% of patients. Generalised anxiety disorder was seen 66% of patients. Other psychiatric morbidities observed were moderate somatization in 28%, interpersonal sensitivity 68% whereas anger ranging from severe to mild form was seen in 66%. It was also supported by studies done by El-Hadidy MA et al in 2012 which found that 38.8%, 29.6% and 9.2% of the patients had major depressive disorder, generalized anxiety disorder, and panic disorder respectively (18) and in the study by Grabsch B et al in 2006 which found that 42% of the women (97/227) had a psychiatric disorder. 35.7%(81) of these had depression or anxiety both. Specific diagnoses were minor depression in 58 women (25.6%), major depression in 16 (7%), anxiety disorder in 14(6.2%), and phobic disorder in 9 (4%) and 17 (7.5%) women had more than one disorder (19).

We took a step further with our study and tried to correlate the various stages of disease presentation with the psychiatric co-morbidities and found that as the stage advances the probability of various psychiatric co-morbidities also increases. Especially in cases with phobic anxiety and anger hostility the relationship with advanced stages were highly significant whereas on the other hand, anger and depression did not show any statistically significant correlation.

IV. CONCLUSION

Analyzing the findings of our study, it was quite evident that a significant number of patients do suffer from psychiatric co-morbidities right from the time of initial presentation. There is an urgent need to detect the incidence and treat these co-morbidities with all possible measures at an early level. There is also a growing importance to conduct large scale surveys of psychiatric disorders in these patients to evaluate the nature and extent of prevailing disease and to trace its temporal profile and also study its psychosocial determinants which are known to contribute to psychiatric disorders. Body image is an important issue in women irrespective of age status, and receiving treatment tailored accordingly to suit the appearance serves as an important tool in improving long-term mental health outcomes. It was also seen that all the patients cannot be considered as having clinically significant psychological problems. Therefore, a detailed evaluation of patients is necessary to understand who all wants intense psychological treatment. Our study also highlights the dominant role of a supporting hand to the patient, from family or friends to assist in the new adjusting phase of life and to maintain homeostasis for both patient as well as the family members.

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Effect of Chlorfenapyr (sub-lethal concentration) on Development, Growth and Reproductive Performance of *Tribolium castaneum* (Herbst) (Coleoptera: Tenebrionidae)

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Abstract-The insecticide Chlorfenapyr that inhibits Adenosine Tri Phosphate (ATP) production in cellular structure of insects was first registered in the USA for control of termites, cockroaches and ants under the trade name Phantom. In the present work Chlorfenapyr 5% SL (INTREPID\(^TM\)) was used to observe the effect on the *Tribolium castaneum* development, as well as growth. The sub-lethal concentrations of Chlorfenapyr were given to first instar larvae of *Tribolium castaneum* through diet of wheat flour for 24 hours. There was effect on development and growth of *Tribolium castaneum* life cycle by dose dependent manner. There was reduction in larval weight, % pupation and time taken for pupation. Similarly there was reduction % adult emergence and time taken for adult emergence. Adult reproductive potential, fecundity and egg hatchability was also affected. The adult emerged from LC\(_{20}\) concentration laid 76% non-viable eggs and the larvae which were emerged from viable eggs survived for 9 to10 days. The adult emerged from LC\(_{40}\) concentration laid 87% non viable eggs and the larvae which were emerged from viable eggs survived for 6-7 days.

When adults of different ages 2, 3, 4 day old, treated with Chlorfenapyr through diet, exhibited trans-ovario-ovicidal activity. Which were reflected by production of non-viable eggs. Fecundity of treated adults was reduced in dose dependent manner. In the Morphometric studies sub-lethal doses of Chlorfenapyr (LC\(_{20}\) and LC\(_{40}\) concentrations obtained via food) when given topically to the newly emerged adults, showed varied length of the life cycle stages of *Tribolium castaneum*.

The newly formed pupae when treated with concentrations higher than LC\(_{20}\) and LC\(_{40}\) i.e. 0.2, 0.4 ppm of Chlorfenapyr showed the morphological deformities in emerging adults. It was in the form of reduced wings and incomplete shedding of pupal case. When female and male of *Tribolium castaneum* both were treated topically by the sub-lethal concentration of Chlorfenapyr, showed drastic difference as compared with, when only female or male were treated.

**Key words**: Biological parameter, Chlorfenapyr, Egg hatching, Sub-lethal concentration, *Tribolium castaneum*.

I. INTRODUCTION

For the health of whole Nation Food security is very vital, moreover, for its independence and honour among the community of Nations in the world. According to World Food Summit (WFS) declaration, more than 800 million people mainly in developing countries do not have enough food to meet their basic nutritional needs. Shortage in...
food grain production can lead to harmony upsetting in the world. Therefore insect pests are the major concern. A poor post-harvesting technology has reduced 35% of crop annually. The synthetic pesticides reduce these losses by constituting an efficient method. Man has struggled to protect his crops from evasion by insects, microbial pathogens and other pests, over the centuries. Almost any kind of stored grains are subjected to attack by insects, which are highly specialized and in most cases are of small size and have high reproductive potential, which make them easily concealed in grains and carried to many parts of the world. Approximately one third of the global food production is destroyed annually by field and storage pests. *Tribolium castaneum* (Herbst), commonly called Red flour beetle, is wide spread stored grain insect [1]. It is cosmopolitan pest which primarily attacks milled grain products and is of great economic importance. It is affinity for raw stored grains, milling facilities, food warehouses [2]. Both adult and larvae feed on grain dust and broken grains but not undamaged whole grains. Although, it develops well on broken grain kernels or processed grain products [3], damages flour and bakery, bran, cereals, and dried fruits. Quality and quantity of stored products are adversely affected by *Tribolium castaneum* [4]. Furthermore, *Tribolium castaneum* secrets lethal chemicals [5], which directly attacks on the grains and as a result grains are contaminated mainly due to hydroxyl quinine [6]. The beetle has a stable carabolic smell due to benzoquinones secretion [7], which passes from the contaminating grain to the flour and may have carcinogenic effects [8]. *Tribolium castaneum* is originally much more pesticide resistant than other stored product insects and this resistance can rapidly increase more than 10 fold. Its short development cycle and easiness of laboratory cultures maintain on a simple medium has made this species a popular choice as a model organism for studying pesticide effects [9].

The insecticidal pyrole Chlorfenapyr (INTREPID™) is new compound which was initially registered in USA to control termites, cockroaches and ants. Its activity is based on the mitochondrial effect. Its mode of action is totally different from conventional pesticides. It functions to uncouple oxidative phosphorylation of ATP production and loss of energy leading to cell dysfunction and subsequent death of organism [10]. Insect metabolic processes are influenced by Chlorfenapyr insecticides due to which they are in demand against many field pests to protect vegetables like cabbage, chillies and cotton plant. Present studies had undertaken to evaluate the effect of Chlorfenapyr on, Biological and Morphometric parameters of different developmental stages like adult, egg, larvae, and pupae of *Tribolium castaneum* to suggest suitable management options.

II. MATERIAL AND METHODS

A. Maintenance of culture of *Tribolium castaneum*

*Tribolium castaneum* culture was maintained whole wheat flour which was 95% and Brewer’s yeast was 5% by weight, at 29±1°C and 60% relative humidity. Eggs were collected every two days from cultures, by sieving (sieve number 40) diet infested with adults. Newly emerged adult were obtained by collecting pupae and monitoring them for adult emergence.

B. Studies of dose response on first instar:

The preparation of stock solution of Chlorfenapyr was carried out. Different volumes of Chlorfenapyr from stock solution were made and then thoroughly incorporated into diet. For the complete evaporation of solvent from treated flour, was kept at room temperature, before experiment was started. The LC_{20} and LC_{40} values of Chlorfenapyr through diet was determined by releasing neonates of *Tribolium castaneum* in diet treated with various concentrations of insecticide. Acetone mixed diet was used as control. The tested sets of five replicates with 10 first instar larvae for each concentration were taken. After 7 days interval the mortality was recorded. By regression analysis, the values of LC_{20} and LC_{40} were extrapolated.

C. Effect on larval Development and growth of *T. castaneum*:

The insecticide Chlorfenapyr, its effect of sub-lethal concentrations (LC_{20} and LC_{40}) through diet on larval development growth and morphological end points such as percentage pupation, time taken for pupation, percent adult emergence and time taken for adult emergence was examined. Examination was done by introducing 10 neonates of *Tribolium castaneum* in Chlorfenapyr in treated diet. The tested sets of five replicates were prepared. Acetone mixed diet was used as control. The larvae were transferred to normal diet after 24 hours. These larvae ten at a time, were weighed on seventh day after the start of the experiment.
Observations were made every day, once pupation had begun in any of the treatment, for percentage pupation, time taken for pupation, percent adult emergence and time taken for adult emergence. To analyze the data for significance regression analysis and one way ANOVA was carried out.

**D. Effect on Fertility and Fecundity of Adults T. castaneum:**
The fresh white newly formed pupae were isolated from the culture. These pupae were observed daily for adult emergence. The newly emerged adults were sexed. In the separate glass vials containing diet treated with LC$_{20}$ and LC$_{40}$ of Chlorfenapyr, the two day, three day and four day old, adults were kept in a pair. Acetone treated diet was used as control. Observations were made for their reproductive potential and egg hatchability. All experiments were replicated five times. By ANOVA, the obtained data was analysed and the results were compared by using Students-t test.

**E. Effect on egg hatchability of T. castaneum:**
The hatchability of eggs was determined by placing twenty eggs in the Chlorfenapyr (LC$_{20}$ and LC$_{40}$) through diet, for the observations of effect of insecticide. Acetone treated diet was used as control. Hatching of eggs was recorded every day, till hatching in the control was completed. All the experiments were replicated five times. Data was analysed by two ways ANOVA. Regression analysis was performed to determine dose-dependent relationship.

**F. Effects of topical treatment of Chlorfenapyr on Morphometric measurements and analysis of different life cycle stages of T. castaneum**
The sub-lethal dose (LC$_{20}$ and LC$_{40}$ of Chlorfenapyr as obtained for one day old larvae through diet), its 1µl was given topically to each the of female and male adults on the ventral surface between the mesothorasic and metathorasic legs by using a Hamilton micro-syringe. Distilled water treated adults were kept as a control. The eggs of these topically treated pair were collected and measurements were taken using digital Vernier calliper (MITUTOYO make). The measurements of eggs, neonates, 7th, 10th, 15th day old larvae, pupae, adults were recorded and analysed by ANOVA and Z-test. All the experiments were replicated for five times.

**G. Effects of topical application on Pupae**
By collecting last instar larvae and monitoring them for pupation, newly fresh white pupae were obtained. These pupae were treated from its ventral surface by using Hamilton micro-syringe, with different concentrations of Chlorfenapyr to find out LC$_{20}$ and LC$_{40}$ concentrations. The dispensing volume of solution at any concentration was always 1µl per pupae and control pupae treated similarly with 1µl of distilled water alone. After 24 hours of treatment, the treated and control pupae were transferred to normal diet. Mortality was recorded by observing % adult emergence. LC$_{20}$ and LC$_{40}$ values were deducted by extrapolation of probit mortality. At LC$_{20}$ and LC$_{40}$ treated pupae showed mortality but the development was normal. Therefore higher doses (0.2, 0.4 ppm) of Chlorfenapyr were applied to observe the effect on development of Tribolium castaneum. At these concentrations, observations were made on % adult emergence, abnormal adults, and pupal-adult intermediates and percent normal adults.

**H. Effect of Topical application on adults**
The pupae were isolated and sexed according to [11], and kept separately for emergence of adults, from subcultures of beetles. The dose response was determined by applying 1µl various concentrations of Chlorfenapyr to the ventral surface of the newly emerged, fresh, adults, in-between the mesothorasic and metathorasic legs using a Hamilton micro syringe. Adults treated similarly with 1µl of distilled water alone were used as controls. The treated and control adults were transferred to normal diet, after 24 hours of treatment. Mortality records were noted. The extrapolation of probit mortality was used to derive LC$_{20}$ and LC$_{40}$ values of Chlorfenapyr. The newly emerged female and male adults were treated with LC$_{20}$ and LC$_{40}$ of Chlorfenapyr and their crosses were performed as follows:

1. Normal male × Normal female
2. Treated male × Normal female
3. Treated female × Normal male
4. Treated male × Treated female

Five replicates per concentration and a pair of adults per replicate were prepared. After 24 hours of the treatment normal diet was provided to above adults. Observations were made on adults fertility, reproductive
potential and ovi-position. All experiments were replicated five times. Eggs were collected daily up to the seventh day after the treatment. Thus fecundity and fertility was recorded. This data was analyzed by one way ANOVA.

III. RESULTS:

A. Effect on larval Development and growth of T. castaneum:
The sub-lethal concentrations of Chlorfenapyr via food to newly hatched larvae of Tribolium castaneum derived from the regression equation were LC\textsubscript{20} = 0.0094ppm, and LC\textsubscript{40} = 0.0256ppm (Fig. A.1). Dietary treatment of Tribolium castaneum larvae with sub-lethal concentrations of Chlorfenapyr (LC\textsubscript{20} and LC\textsubscript{40}) significantly reduced the larval weight on seventh, tenth and fifteenth day in dose dependent manner. Similarly pupae and adults weight was also reduced as compared to the control in dose dependent manner (Fig.A.2). A significant reduction in larval survival (%), pupal formation (%) and adult emergence (%) were observed with increase in concentration of Chlorfenapyr (Table A.1, Fig.A.3). Furthermore adults emerged from larvae fed on diet at LC\textsubscript{20} and LC\textsubscript{40} concentrations, laid non viable eggs (76% and 87% respectively). At LC\textsubscript{20}, larvae which emerged from viable eggs died immediately or survived up to 9-10 days. Similarly at LC\textsubscript{40} which emerged from viable eggs survived up to 6-7 days of larval stage.

B. Effect on Fertility and Fecundity of Adults T.castaneum:
When the number of eggs laid by treated two, three, four day old adults were compared with control, using ANOVA test. The student t-test for equality of average was also found to reduce in dose dependent manner (Table B.1) (Where, t\textsubscript{18, 0.05} = 2.101). It was observed that, the average fertility rate was reduced.

C. Morphometric Measurements of different life cycle stages of T.castaneum:
The sub-lethal concentration of Chlorfenapyr effect on different stages of Tribolium castaneum viz eggs, neonates, 7\textsuperscript{th}, 10\textsuperscript{th}, 15\textsuperscript{th} day old larvae, newly formed pupae and adult were compared with control. The length of all stages were analysed by ANOVA and Z test the value (Z, 0.05=1.64)(Table C-1), in which results showed all the values were significant. The length of each of the developing stages was reduced in dose dependent manner as compared to control. (Table C1) (Fig-C1-C10)

D. Effect of topical application on Pupae of Tribolium castaneum
The LC\textsubscript{20} and LC\textsubscript{40} values for topical application of newly emerged adults deduced from extrapolation of probit log analysis were LC\textsubscript{20} = 0.029 ppm and LC\textsubscript{40} = 0.101 ppm (Fig D1) at these concentrations, mortality was recorded with no abnormalities of emerging adult. High dose of Chlorfenapyr 0.2 and 0.4 ppm treatment to newly formed pupae results into 63.33% and 86.66% mortality respectively during pupal stage itself. Newly formed pupae, when treated with higher concentrations of 0.2 & 0.4 ppm of Chlorfenapyr the emerging adults had morphological deformities. They were with reduced wings and unable to free themselves from pupal cuticle (FigD-2, 3). There was delay in adult emergence with increasing concentration of Chlorfenapyr as compared with control (Table D-1).

E. Effect of topical application on adults of Tribolium castaneum
The LC\textsubscript{20} and LC\textsubscript{40} values for topical application of newly emerged adults deduced from extrapolation of probit log analysis were LC\textsubscript{20} = 0.05 ppm and LC\textsubscript{40} = 0.127 ppm (Fig E1) When either sex adults of Tribolium castaneum were treated topically with sub-lethal concentration of Chlorfenapyr there was reduction in fecundity as compared to that of control, (Table E1 and E2). The fecundity of normal females when crossed with treated males was less in both the concentrations respectively than that of control (Fig. E2). When only females treated by sub-lethal concentration of Chlorfenapyr crossed with normal males, number of eggs laid was lesser than that of the pair in which the normal females and treated males were crossed (Fig. E3). Fecundity was reduced when both sexes Tribolium castaneum were treated compared to the pair in which any one sex was treated, (t\textsubscript{12, 0.05}=2.179) (Table, E1 and E2) (Fig. E4). In LC\textsubscript{20} concentration, the average number of eggs laid by pair in which treated female crossed with normal male were more than that of both the sexes were treated (Table E3 and E4). At LC\textsubscript{40} concentration, the average number of eggs laid by a pair with treated female was not equal to the pair in which only males were treated. The increasing concentrations of insecticide Chlorfenapyr decrease the reproductive potential of adults, irrespective of gender.

IV. Discussion
Laboratory evaluation of sub-lethal concentrations LC$_{20}$ and LC$_{40}$ of Chlorfenapyr on different stages of *Tribolium castaneum* revealed that it affects the development and growth of the larvae. First instar of *Tribolium castaneum* treated with sub lethal concentration of Chlorfenapyr through diet showed retardation in growth by lowering the larval weight on 7th, 10th, 15th day development. Similar observations of reduction in weight of the larvae of *Tribolium castaneum* due to Flufenoxuron treatment was recorded [12]. The adult emergence was delayed by 5 to 6 days in LC$_{20}$ and by 19 to 20 days in LC$_{40}$ as compared to control. The adults emerged from both the concentrations laid non viable eggs, (76% for LC$_{20}$ and 87% for LC$_{40}$). Hatching from the remaining viable eggs resulted in 9 to 10 days larval survival in LC$_{20}$ and 6 to 7 days of larval survival in LC$_{40}$. Hatching failure of eggs laid by treated adults and the rise in larval mortality immediately after hatching and reduction in molting stage formation was found in treated doses. This clearly indicates the ovicidal and larvaecidal effect of Chlorfenapyr on *Tribolium Castaneum*. There was variability in response of adults *Tribolium castaneum* of different ages with respect to fecundity when fed on a diet treated with sub-lethal concentration of Chlorfenapyr. Our observations of dose dependent variability in fecundity was in agreement with those observed in lufenuron treated *T. Castaneum* [13]. All specific age adults like two, three, four day old adults showed a dose dependent effect. Therefore due to Chlorfenapyr insecticide the number of eggs laid by treated adults was reduced as compared to control. Survival of *Tribolium castaneum* from the first instar larvae to adult, through each life cycle stage was definitely affected by Chlorfenapyr. This was irrespective of media of application, like via food or via topical application. The topical application as well as through food treatment of Chlorfenapyr produced marked decline in the number of viable eggs. Reproductive potential of *Tribolium castaneum*, indicated distinct variation due to Chlorfenapyr. Similar observations have been reported in the activity of 3 insect growth regulators for control of tortricids present in Tortino Region [14]. Ovicidal effect have also been reported in the females of *Carpophily s hemipterus* (L) it laid sterile eggs after exposure to benzoylphenylureas [15]. Thus we observed that the treatment of Chlorfenapyr, not only interferes with the normal development of *Tribolium castaneum*, but also affect the reproductive potential of the adults. Chlorfenapyr hampers the supply of energy which needed for all the metabolic activity, thus resulting in growth inhibition. It means this compound uncouples oxidative phosphorylation at the mitochondria, resulting in disruption of ATP production [16], and ultimately showed the effect on development and growth. The effect was on length and molting of the life cycle stages as well. Larval instars treated by Chlorfenapyr, were found as growth inhibited. This is reflected by reduction in weight gain. It has also latent effect on egg hatchability. Similar observations were found in *Spodoptera Littoralis* (Lapidoptera: Noctuidae) of Lufenuron [17]. Therefore in the Morphometric measurements showed the length reduced due to Chlorfenapyr as compare to control.

In the present study the inability of the adults to free themselves from pupal covering, could be due to weakening of elytra by the Chlorfenapyr residue, as well as the wing deformities found in the topical application on pupae, similar observations were reported on, both *Tribolium castaneum* and *Tribolium confusum* on exposure to hydroprene [18]. The reduction in fecundity of treated females and reproductive potentials of males by topical treatment of sub-lethal concentrations of Chlorfenapyr, results in egg sterilization in treated females through disruption of oogenesis and by interference with spermatogenesis in males. Similar observations were made on Flufenoxuron treated *Tribolium castaneum* [11]. The present study reveals that sub-lethal concentration of Chlorfenapyr exhibit transovarial ovicidal activity. Chlorfenapyr affects insect through ingestion or by contact. Chlorfenapyr activates and uncouples oxidative phosphorylation by disrupting mitochondria. Therefore insects die as they are not able to create their own energy. The larvae or adults either would die or fail to develop further and fail to reproduce [10]. Thus Chlorfenapyr can be used in IPM programme to control the population of *Tribolium castaneum*.

V. REFERENCES

33. Thomas, P.J. and Bhatnagar (1968) - Thomas P.L., Use of juvenile hormone analogue as insecticide for pests of stored grain, Nature, 219-224.
Fig. A.1 Regression graph of dose response of Chlorfenapyr via food on first instar larvae of *Tribolium castaneum*

Table A-1 Effect of sub lethal concentration of Chlorfenapyr on development and growth of *T.castaneum*

<table>
<thead>
<tr>
<th>Dose</th>
<th>% Larval survival X ± SE(X)</th>
<th>% pupation X ± SE(X)</th>
<th>Pupal Weight</th>
<th>pupation (Days) X ± SE(X)</th>
<th>% adult emergence X ± SE(X)</th>
<th>Adult weight</th>
<th>Time taken for adult emergence (Days) X ± SE(X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>94 ± 1.56</td>
<td>92 ± 1.47</td>
<td>31.4 ± 2.77</td>
<td>18 ± 1.24</td>
<td>90 ± 1.24</td>
<td>26 ± 4.02</td>
<td>25 ± 1.2</td>
</tr>
<tr>
<td>LC20</td>
<td>74 ± 0.96 *</td>
<td>68 ± 1.92 *</td>
<td>27.3 ± 1.61</td>
<td>24.2 ± 1.03</td>
<td>64 ± 2.0 *</td>
<td>18 ± 1.52</td>
<td>30.2 ± 1.03</td>
</tr>
<tr>
<td>LC40</td>
<td>56 ± 0.96 *</td>
<td>52 ± 1.47 *</td>
<td>20.9 ± 1.78</td>
<td>30.2 ± 2.96</td>
<td>50 ± 1.75 *</td>
<td>13.86 ± 1.89</td>
<td>44.2 ± 2.38</td>
</tr>
</tbody>
</table>

* Significance at 5 % level of significance.

Fig. A.2 Effect of sub-lethal concentrations of Chlorfenapyr on development and growth of *Tribolium castaneum* comparing weight in mg.

Fig. A.3 Average survival rate of larvae, Pupae and adult of *Tribolium castaneum* in control and Chlorfenapyr treated (LC20 and LC40).
Table B.1 Effect of sub-lethal concentrations of Chlorfenapyr on fertility and fecundity of adults of different ages of *T. castaneum*

<table>
<thead>
<tr>
<th>To test</th>
<th>2 days old adult</th>
<th>3 days old adult</th>
<th>4 days old adult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ho: $\mu_1=\mu_2$ against H1: $\mu_1 &gt; \mu_2$</td>
<td>2.546818</td>
<td>7.223649</td>
<td>14.21557</td>
</tr>
<tr>
<td>Ho: $\mu_1=\mu_3$ against H1: $\mu_1 &gt; \mu_3$</td>
<td>3.925679</td>
<td>10.47855</td>
<td>18.3553</td>
</tr>
<tr>
<td>Ho: $\mu_2=\mu_3$ against H1: $\mu_2 &gt; \mu_3$</td>
<td>2.13809</td>
<td>3.628247</td>
<td>8.142857</td>
</tr>
<tr>
<td>Conclusion</td>
<td>$\mu_1&gt;\mu_2&gt;\mu_3$</td>
<td>$\mu_1&gt;\mu_2&gt;\mu_3$</td>
<td>$\mu_1&gt;\mu_2&gt;\mu_3$</td>
</tr>
</tbody>
</table>

$t_{18,0.05}=2.101$

All values are significant.

Table C.1 Morphological measurement of different stages of *Tribolium castaneum* control and Chlorfenapyr treated (LC$_{20}$, LC$_{40}$ via Food)

<table>
<thead>
<tr>
<th>Different stages of <em>Tribolium castaneum</em></th>
<th>Eggs</th>
<th>1st instar Larvae (2Day old)</th>
<th>7 day Larvae</th>
<th>10 day Larvae</th>
<th>15 day Larvae</th>
<th>Pupae Length</th>
<th>Adult Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\mu_1-\mu_2$</td>
<td>25.87652</td>
<td>26.50293</td>
<td>8.048299</td>
<td>48.62107</td>
<td>181.5159</td>
<td>12.42298</td>
<td>14.61627</td>
</tr>
<tr>
<td>$\mu_1-\mu_3$</td>
<td>34.4424</td>
<td>43.28499</td>
<td>59.425</td>
<td>112.273</td>
<td>49.68933</td>
<td>22.68223</td>
<td>29.08403</td>
</tr>
<tr>
<td>$\mu_2-\mu_3$</td>
<td>8.127949</td>
<td>23.11146</td>
<td>-0.4505</td>
<td>9.540551</td>
<td>10.67078</td>
<td>6.997114</td>
<td>14.95668</td>
</tr>
<tr>
<td>Conclusion</td>
<td>$\mu_1&gt;\mu_2&gt;\mu_3$</td>
<td>$\mu_1&gt;\mu_2&gt;\mu_3$</td>
<td>$\mu_1&gt;\mu_2&gt;\mu_3$</td>
<td>$\mu_1&gt;\mu_2&gt;\mu_3$</td>
<td>$\mu_1&gt;\mu_2&gt;\mu_3$</td>
<td>$\mu_1&gt;\mu_2&gt;\mu_3$</td>
<td></td>
</tr>
</tbody>
</table>

$Z_{0.05}=1.64$

All values are significant except ($\mu_2-\mu_3$) for 7 days Larvae.

Comparative figures of lengths *T.castaneum*, treated by via food dose given topically to newly emerge adult, figures of F2 generation.
Figure C-1 (I to VIII) – Variation in lengths of life cycle stages of *Tribolium castaneum* due to Chlorfenapyr treatment.

(A) -Control,

(B) -LC_{20}\%

(C) -LC_{40}\%
**Figure C-9** Comparative Lengths of life cycle stages of *Tribolium castaneum* of Control and Chlorfenapyr treated (LC$_{20}$, and LC$_{40}$).

**Figure C-10** Comparative Lengths of life cycle stages of *Tribolium castaneum* of Control and Chlorfenapyr treated (LC$_{20}$, and LC$_{40}$).

**Figure : D-1** Regression graph of dose response of Chlorfenapyr via Topical application on *Tribolium castaneum* (Pupae)

\[ y = 1.081x + 2.582 \]

\[ R^2 = 0.955 \]
*Tribolium castaneum*

Fig D, 2 Abnormal wings formed in adult due to topical treatment of pupae (at 0.2 ppm concentration)

Fig D, 3- Pupal-adult intermediate with incomplete shedding of pupal case due to topical treatment of pupae (at 0.4 ppm concentration)

Table D1 – Effect of Topical application on Pupae

<table>
<thead>
<tr>
<th>Concentration (ppm)</th>
<th>Control</th>
<th>L.C_{20}</th>
<th>L.C_{40}</th>
<th>0.2</th>
<th>0.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Mortality</td>
<td>0</td>
<td>20</td>
<td>40</td>
<td>63.33</td>
<td>86.66</td>
</tr>
<tr>
<td>Time taken for adult emergence (in days)</td>
<td>3-4</td>
<td>6-7</td>
<td>7-8</td>
<td>9-10</td>
<td>11-12</td>
</tr>
<tr>
<td>Normal adults out of survived (%)</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>27.27%</td>
<td>0%</td>
</tr>
<tr>
<td>Abnormal adults out of survived (%)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>72.70%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Fig. : E-1 Regression graph of dose response of Chlorfenapyr via Topical Application on adult *Tribolium castaneum*

\[
y = 1.443x + 3.157 \\
R^2 = 0.957
\]
Table : E-1 Effect of Topical application of Chlorfenapyr on fecundity of adult *Tribolium castaneum* :

<table>
<thead>
<tr>
<th>Chlorfenapyr Dose in ppm</th>
<th>Normal Male X Normal Female (µ1)</th>
<th>Treated Male X Normal female (µ2)</th>
<th>Treated female X Normal male (µ3)</th>
<th>Treated Male X Treated female (µ4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC ⁰₂₀</td>
<td>71.2 ± 1.77904</td>
<td>40.6 ± 1.4026</td>
<td>24.6 ± 1.0545</td>
<td>17.4 ± 1.5476</td>
</tr>
<tr>
<td>LC ⁰₄₀</td>
<td>71.2 ± 1.77904</td>
<td>30.4 ± 2.1292</td>
<td>21.2 ± 2.2081</td>
<td>10.8 ± 3.4233</td>
</tr>
</tbody>
</table>

µ₁ = average no, of eggs laid by Normal male X Normal female
µ₂ = average no, of eggs laid by Treated Male X Normal female
µ₃ = average no, of eggs laid by Treated female X Normal male
µ₄ = average no, of eggs laid by Treated Male X Treated female

Table : E-2 ANOVA Conclusion

<table>
<thead>
<tr>
<th>To test</th>
<th>Egg laying by LC ⁰₂₀ treated pair</th>
<th>Egg laying by LC ⁰₄₀ treated pair</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ho: µ₁=µ₂ against H₁:µ₁ &gt; µ₂</td>
<td>4.719436</td>
<td>6.04461</td>
</tr>
<tr>
<td>Ho: µ₁=µ₃ against H₁:µ₁ &gt; µ₃</td>
<td>6.592873</td>
<td>8.257228</td>
</tr>
<tr>
<td>Ho: µ₁=µ₄ against H₁:µ₁ &gt; µ₄</td>
<td>9.2014</td>
<td>10.38912</td>
</tr>
<tr>
<td>Ho: µ₂=µ₃ against H₁:µ₂ &gt; µ₃</td>
<td>2.862014</td>
<td>1.985047</td>
</tr>
<tr>
<td>Ho: µ₂=µ₄ against H₁:µ₂ &gt; µ₄</td>
<td>5.896611</td>
<td>4.543013</td>
</tr>
<tr>
<td>Ho: µ₃=µ₄ against H₁:µ₃ &gt; µ₄</td>
<td>1.488417</td>
<td>3.335802</td>
</tr>
</tbody>
</table>

Conclusion: µ₁>µ₂>µ₃ , µ₁>µ₄, µ₂>µ₄, µ₃ = µ₄
µ₁>µ₂>µ₄ , µ₂>µ₄, µ₃ >µ₄, µ₂ = µ₃

All values are significant except for hypothesis Ho: µ₃=µ₄ against H₁:µ₃ > µ₄ for egg laying for LC ⁰₂₀ and Ho: µ₂=µ₃ against H₁:µ₂ > µ₃ for egg laying for LC ⁰₄₀.
Fig. E2 Fecundity of treated Male X untreated Female of *T. castaneum*

Fig. E3 Fecundity of treated Female X untreated Male of *T. castaneum*

Fig. E4 Fecundity of treated Female X treated Male of *T. castaneum*
Entrepreneurship Education and Employment Performance

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Abstract- Underemployment problems and job stress of post graduate students have gradually become a serious problem. Yet there is a scarcity of research that has attempted to identify the nature, extent and specificity of the problem. This paper aims to find out whether entrepreneurship education can improve job satisfaction and promote employment by finding the impact of entrepreneurship education on increasing employment performance. This paper surveys the post graduate students of Faculty of Commerce and Management Studies from University of Kelaniya and attained their entrepreneurship and employment performance value. The paper draws a conclusion by making correlation analysis and multiple regression analysis. The results showed that entrepreneurship has a positive impact effect on the employment performance. It is confirmed entrepreneurship education has a positive effect on employment performance of post graduate students. The paper made a link between the entrepreneurship research and the employment study. And this study provided a theoretical supporting to the concept of “Encouraging entrepreneurship to drive employment”. This provided the rationality and necessity of entrepreneurship education also.

Index Terms- Entrepreneurship, Entrepreneurship Education, Employment Performance

I. INTRODUCTION

Underemployment of Postgraduate students of state universities continuous to be a serious and growing problem in Sri Lanka, but it has received limited research attention. Moreover, there is a scarcity of theoretically based research that has examined the concept of opportunity for skill use or other career experience such as job, career and life satisfaction amongst underemployed students. Thus, little is known about the extent to which underemployed students are disadvantaged in their early careers. This is despite research that suggests underemployment, also referred to as over education, and is a substantive and expanding problem in Sri Lanka.

Moreover, higher education in Sri Lanka has made great progress and higher education enrollment has increased from 7513 to 8141 in 2015. With the development of higher education, employment levels continue to decrease, specifically in the initial employment rate, job selection, salary and so on. Furthermore, because of the underemployment, they don’t have any satisfaction of their job and it will help to increase job stress. Hence, the problem of graduates’ and post graduates’ employment is not only a prominent economic problem, but it has become a serious social problem and it has involved considerable attention. Therefore, the Sri Lankan government issued a series of policies to reduce the current pressure on underemployment and promote employment of post graduates.

Thoroughly, look at post graduates’ employment, one hand because of the urban and rural, regional imbalance in economic development, one hand because in the current education system and model, many students have difficulties in adapting with the suitable and complacent job. Therefore, to tackle the tough problem, the government should improve employment and entrepreneurship environment and there is a need to develop entrepreneurship education and foster innovative and entrepreneurial talent to improve post graduate students’ entrepreneurship and the ability.

Therefore, this paper aims to find out whether entrepreneurship education can encourage employment and improve job satisfaction by finding the impact of entrepreneurship education on increasing employment performance.

II. LITERATURE REVIEW AND SPECIFICATION OF HYPOTHESIS

The employment performance includes two aspects of acquisition performance and sustained performance. (Luu, 2011). The former part refers to the competitiveness, satisfaction, smooth and salary level of the individual for employment, the latter part refers to the individual’s performance and competitiveness in the workplace (Luu, 2011). Because of the limitation of acquisition data, we mostly tested the empirical correlation between entrepreneurship and acquisition performance.

Situational theories assume that the interaction of variables such as task characteristics, organizational characteristics and individual characteristics influences job satisfaction (Hoy, W.K & Miskel, C.E., 1996). According to the study of Quarstein et al. (1992), overall satisfaction is a function of a combination of situational characteristics and situational occurrences. The situational characteristics usually proposed as key factors in job satisfaction are: the work itself, pay, promotion, supervision and co-workers, although other variables such as education, employee involvement and organizational commitment may impact also (Smith, P.C, Kendall, L.M, & Hulin, C.L, 1969). There have been numerous studies into job satisfaction which explore the impact of demographic characteristics such as age, gender, tenure, and education (Clark, 1993; Clark, A & Oswald, 1993).
A., 1995; Hickson, C. & Oshagbemi, T., 1999; and Oshagbemi, 1998). The results suggest the existence of relationships between demographic characteristics and job satisfaction, but the evidence tends to be mixed, with positive and negative relationships sometimes identified for the interactions between same variables. The term entrepreneurship education is used interchangeably with entrepreneurship training and skill acquisition. In 1989, Colin Bor presented a report to the Organization for Economic Cooperation and Development. In that report, he advised the concept of entrepreneurship education. He mentioned that in the future people should master three “education passports”, one is academic, one is professional and the third is about the dedication and skills development. Entrepreneurship education should provide opportunity recognition, integration of resources to face the risk and creating enterprises with specific guidance to the students, while the newly created corporate management should also be provided to students, such as business plan preparation, capital development and marketing, cash flow analysis (Minniti & Levesque, 2008).

Entrepreneurship generally refers to the pioneering, innovative, bearing risk idea, personality, determination, style and quality, etc. which is the momentum to facilitate new business formation, development and growth. A person who has no business or fails in entrepreneurship could also have entrepreneurship. Schumpeter, (1934), divided entrepreneurship into five parts, namely, need for achievement, locus of control, risk taking propensity, tolerance of ambiguity, self confidence and innovativeness. Furthermore he suggest that, those characteristics called entrepreneurial traits and they can be built/shape through entrepreneurship education. Liu, (2011) also agreed with that statement and he also used those five dimensions of entrepreneurial traits to measure entrepreneurship education in his study. In the study of Liu, (2011) he discusses the correlation between undergraduates’ entrepreneurship and employment performance by considering the undergraduate students of Jilin University as population, his results show that the entrepreneurship has a positive influence on employment performance.

According to research needs, we measure entrepreneurship by entrepreneurial traits and employment performance by satisfaction of job. And proposed hypothesis of the study are,

H1: Need for achievement helps to improve employment performance.
H2: Locus of Control helps to improve employment performance.
H3: Self-confidence helps to improve employment performance.
H4: Innovativeness helps to improve employment performance.
H5: Risk taking propensity helps to improve employment performance.

III. Methodology

Primarydata was used in this study to empirically test the hypotheses. The primary data collection process of this study intends to utilize a self-administered questionnaire. The questionnaire is structured into three (03) sections. Demographic and family information are collected in the section A to develop a profile of the sample and this table includes gender, department and type of work. Section B focuses on the respondents’ personality traits to measure the entrepreneurship. There are five parts, need for achievement table, locus of control table, risk taking propensity table, tolerance of ambiguity table, self confidence table and innovativeness table. Parts of the tables consult the Koh and Chey, (1996) summary of scholars and tested tables. The same scale used by Bezzina, (2010); Dinis et al., (2013); Karimi et al., (2011) for their studies to measure psychological characteristic associated with entrepreneurship. Among them, in the locus of control table, the first five items are negative selections; last five items do not need to do the reverse treatment. Need for achievement table is required to do the reverse treatment, the first five items of the tolerance for ambiguity table need to do reverse treatment, while in the risk-taking propensity table, the last four items need the reversed treatment. Self-confidence table is not required to do the reverse treatment.

Employment performance table also uses the Likert table as above. Employment performance is measured by the respondents’ evaluation about the satisfaction of his/her job. It consists of six items, the degree of willingness to adhere to the job that is the degree of satisfaction of it (one is the least satisfactory, five is the most satisfactory).

The study aims at exploring whether entrepreneurship has positive effects on the promotion of employment performance of new post graduates, therefore, university students are the respondents. Hence, the study intends to adhere to a sample from students of five master programmes of Faculty of Commerce and Management Studies, University of Kelaniya, Sri Lanka. The questionnaires were distributed to students attached to five master programmes of the faculty. They are, Master of Business Administration, Master of Business, Master of Human Resource Management, Master of Marketing Management and Master of Commerce. We have distributed a total of 250 questionnaires and returned 234 questionnaires out of which, and the effective rate was 93.6 per cent. From the gender perspective, 105 boys (44.87 per cent) and 129 girls (55.13 per cent) responded, this is shown in Table 01.

IV. Data Analysis and Hypothesis Test

To test whether the data set in lined with outliers, univariate normality and multicollinearity in the study, the researcher has conducted exploratory analysis in SPSS 20 (Statistical Package for Social Sciences). Firstly, as a protective step, researcher performed Series Mean function to exclude all the missing values of the data set. After that, the study moved to recognition and handling outliers of the study. Normality of continuous variables were tested and then testing for Multicollinearity was examined. After that, autocorrelation was tested and Homoscedasticity was examined by residuals. Finally by using simple regression analysis and correlation analysis, hypothesis were tested.

Correlation analysis were done among all the variables to find out whether there is any relationship among the variables. Measurement of employment performance is obtained by the questionnaire scores of 41 to 47 questions. And the sum of the scores of these six questions is the employment performance score of the students. The higher the score, he gets the higher the employment performance and the respondent is more satisfied with his employment results. Data of the various components of
entrepreneurship depend on the questions in the first five parts, in each table, the higher the total score, the stronger need for achievement, the stronger locus of control, the strong pursuit of self-confidence, the stronger innovativeness and having stronger propensity to taking a risk.

Here, we show the correlation between entrepreneurship and employment performance in Table 02 using the method of correlation coefficient. Specifically, correlation analysis was conducted between the dependent variable ‘employment performance’ with the independent variables namely ‘need for achievement, locus of control, self-confidence, innovativeness and risk taking propensity’. According to the correlational values presented in the Table 02, statistical significant relationship is observed at the surface level. More in detail, it is observed that employment performance and entrepreneurship education are associated with a positive relationship suggesting a same direction. And employment performance and entrepreneurship education association is statistically significant.

Locus of control has the highest impact on the students’ employment performance and Risk taking propensity has the least impact. The stronger the internal control the higher the value of their employment performance.

Finally, to find out the significant impact or influence of independent variable on the dependent variable the regression analysis has done. Hence, to identify the significant determinants of performance of post graduate students and to test the hypotheses stated the researcher used multiple regression analysis.

In Table 03, model summary, the analysis of the ordinary least square regression results of the model of the study is shown. It depicts the relationship between the dependent variable (employment performance of the students) and independent variables (need for achievement, locus of control, self-confidence, innovativeness and risk taking propensity) of the study. As per the table, 04, a high level of model fit (81%) was observed with R² value.

ANOVA table of the study shown in Table 04 in the Regression Analysis. Besides, table 04, affirms the overall model fit of the study suggesting a significant P value which is 0.000. Therefore, the researcher suggests the 75.5% impact is in the significant level in the study.

Furthermore, according to the table 05, independent variables are statistically significant, (at 5% level) (0.000). Hence, researcher realized that entrepreneurship education is the statistical significance predictor variable of the employment performance of post graduate students of the study. Nonetheless, positive beta coefficients of five independent variables mean that an increase of this variables bring about an increase in the employment performance of students.

In the present study, hypothesis were tested by using multiple regression analysis. In the above chapter, researcher developed seven (05) hypothesis to test through the research. In this section of the chapter, the researchers intend to test those hypothesis by using SPSS output of regression analysis and results can be stated as follows;

<table>
<thead>
<tr>
<th>No</th>
<th>Hypothesis</th>
<th>P Value</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Need for achievement helps to improve employment performance.</td>
<td>0.010</td>
<td>Accept</td>
</tr>
<tr>
<td>H2</td>
<td>Locus of Control helps to improve employment performance</td>
<td>0.000</td>
<td>Accept</td>
</tr>
<tr>
<td>H3</td>
<td>Self-confidence helps to improve employment performance</td>
<td>0.000</td>
<td>Accept</td>
</tr>
<tr>
<td>H4</td>
<td>Innovativeness helps to improve employment performance</td>
<td>0.002</td>
<td>Accept</td>
</tr>
<tr>
<td>H5</td>
<td>Risk taking propensity helps to improve employment performance</td>
<td>0.000</td>
<td>Accept</td>
</tr>
</tbody>
</table>

V. DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

This study discusses the correlation between post graduate students’ entrepreneurship and employment performance by considering the masters students of University of Kelaniya, Sri Lanka. According to the results, the entrepreneurship has a positive impact on employment performance. Thus, it not only suggests the importance of entrepreneurship and entrepreneurship education in theory but also provides empirical support for the conduct of entrepreneurship education and entrepreneurship training. Currently, three conventional universities in Sri Lanka offers entrepreneurship degree programmes for post graduate students. It is very important to offer entrepreneurship degree programmes by other universities also. Schools and universities should bear the first responsibility of entrepreneurship education. Carrying out entrepreneurship education through the educational content and classroom climate will increase the quality of the educator to help the students better adapt to job market requirements. Therefore, in order to improve entrepreneurship, great efforts should be put on entrepreneurship education and researching the models and content of entrepreneurship education, also schools should offer different kinds of education to adapt to the various groups, so as to enhance the entrepreneurship to the greatest degree. And companies should launch employment support policies to encourage entrepreneurship. Support entrepreneurship policies on the one hand can support entrepreneurship practices, improve the success rate of business and can directly solve the problem of employment. On the other hand, could help students focus on entrepreneurship, improve the status of entrepreneurship among post graduates’ employment options, thus it will make entrepreneurship become one of the routine employment options and improve the rate of starting a business and the success rate.
Moreover, Universities and companies should create entrepreneurship atmosphere and raise entrepreneurship awareness. Students should take the initiative to improve their entrepreneurship intentionally by strengthening the study and knowledge of entrepreneurship, applying entrepreneurship skills to community activities, and etc. Thus they can gradually create entrepreneurship atmosphere and the entrepreneurship awareness could be enhanced. Meanwhile, this paper also explains that entrepreneurship education is paramount important and justifiable. By successfully imparting entrepreneurship education, the young post graduates will not only improve their personal qualities but will also secure good jobs.

Finally, when addressing the concern of the implication for the body of knowledge, this study adds new knowledge to the existing body of knowledge while confirming entrepreneurship education and employment performance are positively related. However, the paper has a number of limitations. The sample drawn from the population are limited to the University of Kelaniya. And future researchers can take undergraduates as their sample. Furthermore, in this study, entrepreneurship education measured by entrepreneurial traits. Future researchers can use any other factors to measure entrepreneurship education.

Appendix

Table 1: Description of the statistical characteristics of the respondents

<table>
<thead>
<tr>
<th>Statistical characteristics</th>
<th>Categories</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>105</td>
<td>44.87</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>129</td>
<td>55.13</td>
</tr>
<tr>
<td>Programme</td>
<td>Master of Business Administration</td>
<td>79</td>
<td>33.76</td>
</tr>
<tr>
<td></td>
<td>Master of Business</td>
<td>36</td>
<td>15.38</td>
</tr>
<tr>
<td></td>
<td>Master of Marketing Management</td>
<td>31</td>
<td>13.25</td>
</tr>
<tr>
<td></td>
<td>Master of Human Resource Management</td>
<td>43</td>
<td>18.38</td>
</tr>
<tr>
<td></td>
<td>Master of Commerce</td>
<td>45</td>
<td>19.23</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>234</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2: Correlation coefficient of the entrepreneurship and employment performance

<table>
<thead>
<tr>
<th>Employment performance</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Need for achievement</td>
<td>0.660</td>
</tr>
<tr>
<td>Locus of control</td>
<td>0.842</td>
</tr>
<tr>
<td>Self confidence</td>
<td>0.770</td>
</tr>
<tr>
<td>Innovativeness</td>
<td>0.731</td>
</tr>
<tr>
<td>Risk taking propensity</td>
<td>0.566</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).
Table 3: Model summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.807&lt;sup&gt;a&lt;/sup&gt;</td>
<td>.819</td>
<td>.755</td>
<td>19.71312</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), NFA, LOC, SC, INN, RTP
b. Dependent Variable: Employment Performance

Table 4: ANOVA Table

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>60006.42</td>
<td>7</td>
<td>8799.406</td>
<td>19.099</td>
<td>.000&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Residual</td>
<td>203899.524</td>
<td>137</td>
<td>481.348</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>162438.098</td>
<td>234</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Predictors: NFA, LOC, SC, INN, RTP
b. Dependent Variable: Employment Performance

Table 5: Impact of the Independent Variables on Dependent Variable

<table>
<thead>
<tr>
<th>Coefficients&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>-5.142</td>
<td>14.037</td>
<td></td>
<td>-4.123</td>
</tr>
<tr>
<td>NFA</td>
<td>1.769</td>
<td>.400</td>
<td>.031</td>
<td>6.477</td>
</tr>
<tr>
<td>LOC</td>
<td>.021</td>
<td>.391</td>
<td>.059</td>
<td>5.528</td>
</tr>
<tr>
<td>SC</td>
<td>1.387</td>
<td>.411</td>
<td>.211</td>
<td>4.621</td>
</tr>
<tr>
<td>INN</td>
<td>.511</td>
<td>.498</td>
<td>.098</td>
<td>2.341</td>
</tr>
<tr>
<td>RTP</td>
<td>1.301</td>
<td>.601</td>
<td>.497</td>
<td>3.218</td>
</tr>
</tbody>
</table>

a. Dependent Variable: Employment Performance

REFERENCES


**AUTHORS**

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To Study the Perception of Student and Teacher for 4 Years B.Ed Program

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* Social Sciences, Hamdard University, Karachi

Abstract- This study is subject to measure the perception of teachers and students related to the new modified curriculum for the 4 years B.Ed degree program. Faculty members of different universities are involved in the designing of curriculum. For this study different hypothesis has been made that define the study outline. Students’ perception was found positive with this regard because they have more knowledge and perfect planning for their future degree program. Teachers knew the comparison among the old and new syllabi of the B.Ed. This study has three hypothesis that measured by the pair t-test. Basic assumptions have been made by the feed-back responses of the respondents who made this study meaningful by their perceptions.

Index Terms- Pair t test, B.Ed program, curriculum modification, curriculum design.

I. INTRODUCTION

The main purpose of this study is to find out some new aspects. The nature of such questions and paucity of existing data needed to answer the questions demands a qualitative research method (Yin, 2009). Basically this work is done to highlight the modifications of curriculum for B.Ed 4 year program. Curriculum design is important for both students and teachers as according to Entwhistle (1988) curriculum design seeks to address two major objectives in undergraduate education: firstly, to enable students to experience "deep" learning; and secondly, to facilitate the development of transferable skills. It has long been recognized that traditional teaching techniques often fail to encourage "deep" learning of subject content, which goes beyond short-term rote memorisation to enable the assimilation of new knowledge in a way which allows reapplication to novel situations. Laterally it was assumed that the process of learning is as important as its product and as teachers we need to be aware of both the formal and informal factors which impact on learning Willis (1977). Despite these decades of research and associated curriculum development, it seems that students’ problem solving abilities still require substantial improvement especially given the rapidly changing nature of today’s world Kuehner & Mauch (2006). Description of general problems of reform in education which are focused more on the absence of accountability, lack of efficiency, insufficient financial allocations and so forth Memon, Joubish, & Khurram, (2010). The important thing for teachers is to visualize the process that how the knowledge transfer to the students in this manner that they receive accurate lecture, learning materials and different assignments or projects to experience practically and this will encourage them to take more interest in the relevant subject Meyers, Noel M. & Nulty, Duncan D (2008).

II. IDENTIFY, RESEARCH AND COLLECT IDEA

Harden (2001) has elaborated on this concept “a curriculum is a sophisticated blend of educational strategies, course content, learning outcomes, educational experiences, assessment, the educational environment and the individual students’ learning style, personal timetable and the program of work”. Teacher quality is therefore crucial and has been globally accepted to be significantly associated with the quality of education in general and students’ learning outcomes in particular Puhan R R, Malla L, Behera S K (2014). This study will become useful in such a way that the tool that is used to collect the feedback from the students it tells that how much students got from the curriculum of this program and how much this course become useful to enhance their professional skills. By this response the thing that is useful for the teachers’ is the effectiveness of their teaching that is measure by the students’ interest in this program. The paired t-test is a type of hypothesis testing that is used when two sets of data are being observed. The data in a paired t-test are dependent, because each value in the first sample is paired with a value in the second sample. The parameter used to make the inference is the difference of the means of both data sets (Stephanie D. Wilkerson, 2008). By the collaboration with USAID the Pakistan has been established a teacher’s education department in 2008 for the training of our teachers according to the modern need and demands. As before this program different universities and colleges are engaged in B.Ed program whose duration is about 1 or 2 years. But after the establishment of this department now a new degree program has been introduced whose duration is about 4 years and the title of the degree now become B.Ed (Hons) degree. The targets was providing the pedagogical trainings to the respectable teachers that demands to learn more for the teaching in new programs. The main theme behind these programs is to introduce the various teachers with the specialized techniques that will helpful for their grooming. HEC did noteworthy efforts in the new program, it involve in providing the effective teachers who are well trained, competent, skilled and experienced for the student learning.

Paired t tests are can be categorized as a type of t test for a single sample because they test the difference between two paired results. If there is no difference between the two treatments, the difference in the results would be close to zero; hence, the difference in the sample means used for a paired t test would be 0 Tae.K.K(2015).
A. Bits and Pieces together

Different researches also support that teacher develop and possess their beliefs about different aspects of teaching on the basis of their experiences as student, as pre-service trainee teachers and through her/his in-service professional development activities teaching and they brought these beliefs in the class Joram & Gabriele (1998);Anderson, Blumenfield, Pintrich, Clark, Marx & Peterson (1995); Wubbels (1992); Zeichner & Gore (1990); Joram & Gabriele (1998); Kagan, (1992); Marso & Pigge (1989); Mertz (1991); Clark (1988).

Following are the certain findings of this research work:

- The specific finding of this research is the measurement of the effectiveness of curriculum structure and design used for 4 year B.Ed progam that is different from previous content not completely but somewhere necessary changes have been done.
- The interest of the students’ as well as teachers’ represents the involvement in the implementation of the B.Ed curriculum and this is basically the positive feedback response related to the latest modification in the curriculum.
- A good teacher is that who understand the problems of the students before their explaining. The tool for this research was designed according to the same concept and it was tried, that both the respondents give their feed-back by imaging the required needs and demands.

B. Use of Simulation software

For the analysis of collected data quantitative software named ‘Minitab 17’ is used. The software proved user friendly and it helped a lot in gathering the data. The software mainly used for the calculation of pair t-test and formation of hyperbolic curve for more illustration.

IV. RESULTS

TABLE FOR HYPOTHESIS I:

<table>
<thead>
<tr>
<th>S.No</th>
<th>PARAMETERS</th>
<th>VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Mean difference</td>
<td>115.5</td>
</tr>
<tr>
<td>3</td>
<td>St Dev</td>
<td>7.2</td>
</tr>
<tr>
<td>4</td>
<td>SE Mean</td>
<td>1.31</td>
</tr>
<tr>
<td>5</td>
<td>T-Value</td>
<td>87.8</td>
</tr>
<tr>
<td>6</td>
<td>P-Value</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Due to the pair t-test α is 0.025 (two tail) and the level of confidence is 95%, the rejection area lie above and below the highlighted region. Hence the p value is 0.0 i.e. less than 0.05. It is critical at this point to realise that we have proven the null hypothesis to be incorrect and alternate hypothesis is accepted. We can state that there is significant relationship among the teachers and students in the perceptions of effectiveness of B.Ed 4 year’s curriculum design. Sahel, Al-Tawil and Al-Hahithi (2013) found that interactive learning was appreciated by students as a suitable method of learning among students. According to these authors students need interaction for learning, students can learn more by group discussion, team work, use of activities and immense use of teacher’s involvement. Most of the students are categorized as the slow learner they need extra care and attention of the teacher, similarly the interaction among the student and the teacher are consider as the strong bond in the society.

TABLE FOR HYPOTHESIS II:

<table>
<thead>
<tr>
<th>S.No</th>
<th>PARAMETERS</th>
<th>VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>Mean difference</td>
<td>118.7</td>
</tr>
<tr>
<td>3</td>
<td>St Dev</td>
<td>5.8</td>
</tr>
<tr>
<td>4</td>
<td>SE Mean</td>
<td>1.0</td>
</tr>
<tr>
<td>5</td>
<td>T-Value</td>
<td>110.5</td>
</tr>
<tr>
<td>6</td>
<td>P-Value</td>
<td>0.0</td>
</tr>
</tbody>
</table>

The p value is 0.0 i.e. less than 0.05. It is critical at this point to realise that we have proven the null hypothesis to be incorrect and alternate hypothesis is correct. We can state that there is significant effect of learning environment and available resources on students training. This results explains that the significant effect of learning environment and available resources on students training by using the latest techniques. The use of ICT produce a fruit full effect on the learning and training of the students. In different private sectors students pay high fees for gaining fruit full effect but those students who cannot afford such facilities they face towards the public sector so now if the same strategies will use for teaching in both type of sectors by this way no one deprive from the modest technologies.

TABLE FOR HYPOTHESIS III:

<table>
<thead>
<tr>
<th>S.No</th>
<th>PARAMETERS</th>
<th>VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>Mean difference</td>
<td>59.2</td>
</tr>
<tr>
<td>3</td>
<td>St Dev</td>
<td>4.7</td>
</tr>
<tr>
<td>4</td>
<td>SE Mean</td>
<td>1.21</td>
</tr>
<tr>
<td>5</td>
<td>T-Value</td>
<td>48.7</td>
</tr>
<tr>
<td>6</td>
<td>P-Value</td>
<td>0.00</td>
</tr>
</tbody>
</table>

The p value is 0.0 i.e. less than 0.05. It is critical at this point to realise that we have proven the null hypothesis to be incorrect and alternate hypothesis is correct. We can state that there is
significant effect of curriculum changes on teachers’ training. This hypothesis directly interprets the necessity of teacher. Not only the students, has teachers also required the specific environment and resources for learning and training that make them professionally skilled person.

V. CONCLUSION
The journey of research is concluded with this positive thinking that education is a vast field, like other subjects it also need changes according to the need and demand of the customer. This project is not a single one which works to find out the relationship among teachers and students, many other projects are also going to work as same but the different thing is the subject specification, this work is only applicable for 4 years B.Ed program that has not introduced before past few years ago. In this project it has been found that the training resources, learning environment, new methodologies and curriculum design is advantageous for both teachers and students that produce a strong interaction among them.

ACKNOWLEDGMENT
I am thankful to almighty ALLAH who give me strength and opportunity to complete this task. I am grateful to Ms Sidra who give me guidance at every step since course work completion till the end of research project. I am highly indebted and thoroughly grateful to Dr Naira Siddiqua who help me in the selection of topic for research project, she help as a mentor, she proved herself a great teacher and best guider. Without her cooperation, coordination and guidance this project cannot be reach at its end. I would also say thanks to Ms Fahmida Jan for being an excellent and jawairya07@gmail.com.

REFERENCES

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The Determinants of Consumers’ Perception towards Online Advertising in Malaysia: A Measurement Model

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Graduate School of Management
Management & Science University, Malaysia

Abstract - The aim of this study is to assess the determinants of consumers’ perception towards online advertising in Malaysia. Present study has been developed the research model by reviewing the existing literatures in the area of factors influencing consumers’ perception towards online advertising. The data are subsequently analyzed to explain the relationships among the variables by employing statistical analysis namely descriptive and inferential statistics. Hence, the quantitative strategy is more appropriate since present study test the hypotheses developed rather than a building theory. To execute the current research, altogether 526 respondents have been selected as a final sample size. This research uses survey method in this study because my purpose of the study is to generalize the findings from the sample to population. The current study used Statistical Software Package for Social Sciences (SPSS) and AMOS Software Package to analyze the data. The results of this study provide evidence that increased consumer perception is associated with increased online advertising. There is a direct positive, significant relationship between consumer perception and online advertising of the respondents in the online advertising in Malaysia. It was also found that all sub dimensions of consumer perception positively and significantly affect to online advertising and its dimensions. The resilience was the strongest predictor of online advertising. Besides, the results indicated the significant positive relationships between consumer perception and consumer acceptance. On the other hand, a significant weak relationship was found between consumer acceptance and online advertising. However, the consumer satisfaction has not correlated significantly with online advertising of the respondents in the online advertising in Malaysia.

Index Terms - Consumer Acceptance, Consumer Perception, Consumer Satisfaction, Determinants, Malaysia, Online Advertising

I. INTRODUCTION

The wave of globalization has led to the rapid transformation of cultures and it facilitates the prospect of global business around the planet. Today, the world is becoming a common market place in which people, no matter where they live, desire the same products and life style (Ekta et al., 2017). Advertising, besides being an important source of revenue for the economy, is a viable and valuable form of communication. Like any form of communication advertisement also requires a ‘medium’ for its communication. Besides on medium of advertising it may be classified as traditional and online advertising (Dou et al., 2002; Cheema & Papatla, 2010; Passyn et al., 2011).

A dominant trend is the movement away from assuming that media exposure equals advertising effectiveness to considering the role of media engagement on effectiveness. Other developments include the increased use of digital video recorder, media fragmentation, new media, expanding advertising clutter, and so on (Abrantes et al., 2013; Ekta et al., 2017). Obviously, advertising plays an important role for consumer experiences, brand recalling, purchase intention and many more. There are few studies also have been done to support the importance of online advertisements. The study done by Amaro and Duarte (2015), described the experience potential of a range of media. They have conducted studies of what consumers think and feel, their qualitative experiences, while they read newspapers, magazines, and websites and watch television. The study shows two different experiences for those media. First is from the statements that are derived from extensive qualitative research with consumers. Magazines and newspapers that provide this experience give their readers a peaceful, quiet escape from their otherwise hectic lives (Ekta et al., 2017).

In particular, the online borderless nature of the internet raises the possibility of product exposure in the global market. Before the electronic media, the core advertisement tool was human advertising and personal selling. Meanwhile, technology keeps on going. It is already gives us the personal computer, the cellular phone, the Internet and the modern electronic communication system where these facilities are simple enough for virtually anybody to use (Erica & John, 2016). In marketing perspective, consumers are always exposed by thousands of commercial messages every day. As the market has now changed and the consumers are now more receptive to the internet and accessible to global information systems, e-marketing and advertisement should be fully leveraged to feed the consumers’ interest. Marketing activities through the internet or e-marketing is practical, more economical and faster as compared to the traditional marketing. Even though the importance
of online is commonly understood, however the lack of identifying factor influences the consumer perception. So, there is a need to identify the critical factors which influence consumers’ perception towards online advertising, especially in Malaysia. Basically, this is a real gap in current Malaysian market. Therefore, from the managerial perspective, the research is meaningful as the research relates to the current issue of low demand for the property products and how advertisement will be effective and boost the property sales. From the academic perspective, the research is significant as very limited things are known about the acceptance of e-marketing for the consumer products. Therefore, this research will focus on the determinants of consumers’ perception towards online advertising in Malaysia.

This article has several sections. After the introductory section, this paper talks about the literature review, followed by research methodology and data analysis. Finally, the paper ends up with conclusion and recommendation that addresses the important issues related to the determinants of consumers’ perception towards online advertising in Malaysia.

II. LITERATURE REVIEW

This section reviews some of the related literatures of the variables. Historically, when the information technology began to expand in 1990, digital technology and information technology has begun a new era (Amireault, 2014). This is where competition among businesses began to start. This will be the biggest challenge since the businesses need to know how to expand the market from local to global. They are using many kinds of technologies to expand. Tool such as video conferencing has been used in terms of communication with supplier and business partners. Also using Internet as tool of product awareness and get direct feedback from consumers and creating strong Customer Relationship Management (CRM) through internet (Ekta et al., 2017).

2.1 Consumers and Advertising

Advertising is an important part of the marketers for promotional mix. It helps in creating brand image and product awareness. However, the designation of advertising certainly reflects the claimed desire of most marketing practitioners to communicate openly and honestly with consumers and that is how the advertising is able to create high revenue in the world of economy. Indeed, the law in most countries forbids false or deceptive advertising. Marketers justify advertising by arguing that advertising is intrinsic to markets and fundamentally beneficial to the customer (Arcand & Nantel, 2012). Bilghian et al., (2014) purport the advent of the printing press brought about a paradigm shift. One could have multiple copies of posters, leaflets or print advertisements in the newspaper to reach many people at the same time. With the growth of the electronic media, followed by the Internet, Short Message Service (SMS) and MMS, the interactive media has now completely transformed the role of the expectations from advertising. The current era is technology driven and customer oriented. A lot of hope rests on the interactive media, which includes the Internet, to create a seamless global market. Connecting almost 300 million users worldwide, the Internet has truly created a seamless market and a global consumer.

2.2 Online Advertising

As like in many other countries in the world, Malaysia is not excluded from using the technologies specifically the computers. Many people and companies feel that having computers and laptops are necessity needs in the global era. Computers can be considered as a self actualization need as mentioned in Maslow Hierarchy of Needs theory (1970) where in this theory mentioned that as a human being we need self actualization as self development and realization so that we may improve ourselves. Technology is one way to achieve that need. Malaysia as a middle income country, transformed its economy from 1971 through the late 1990s from relying primarily on the production and export of raw materials, into one of the world’s leading trading nations in electronics and information technology (IT) goods. The extent of IT penetration in the consumer, local business, industry and research sectors is considerably low. There are many Malaysian companies that have the potential to computerize their businesses or upgrade their computer systems but have not yet done so. The incidence of IT utilization and integration is larger among organizations involved in providing goods and services as compared to those dealing with products manufacturing and distribution (Ekta et al., 2017).

2.3 Conceptual Framework

By reviewing the literature, this research has come up with a model, which is research model. In this current research, three types of variables are available which is known as independent variable mediating variable and dependent variable. The process of identifying these variables was climacteric and in depth studies were taken in order to develop a well founded research model. The dependent variable is of chief importance in this research. The aspirations of this research are to understand the critical factors influencing consumers’ perception towards online advertising of Malaysian perspective. The research model that is shown in Figure I depicts the relationship between the variables used in this study. Based on established relationship found by previous scholars, research model is developed for these variables involved in this study, which consists of Consumer Perception, Consumer Acceptance, Consumer Satisfaction and Online Advertising.
In this research model, altogether five hypotheses are developed to test the relationships among the various variables. The following section presents an exhibition on the five hypotheses developed for this study.

H1: Consumer Perception is positively and significantly correlated with Online Advertising
H2: Consumer Perception is positively and significantly correlated with Consumer Acceptance
H3: Consumer Acceptance is positively and significantly correlated with Online Advertising
H4: Consumer Perception is positively and significantly related with Consumer Satisfaction
H5: Consumer Satisfaction has a positive and significant influence on Online Advertising

III. RESEARCH METHODOLOGY

The present study is based on the quantitative research strategy. Zikmund, et al., (2010) mentioned quantitative researcher develop a model that based on the existing literatures and subsequently test it by gathering data. The research model according to the Sekaran and Bougie (2016) describes that the causal relationship among variables rather than describing variables as either cause or effect in which the cause is the independent variable and the direction of the effect (dependent variable) may either be positive or negative in nature. Thus, present study has been developed the research model by reviewing the existing literatures in the area. The data are subsequently analyzed to explain the relationships among the variables by employing statistical analysis namely descriptive and inferential statistics.

Besides, the sample size is influenced by the number of factors such as the purpose of the study, size of the population, non responsive error, and accuracy of the study (Kothari, 2004; Sekaran & Bougie, 2014). The simplest and appropriate method for deciding a sample size for given population was described by Sekaran & Bougie, (2016), whose book elaborated the scientific guidelines with a table which facilitate to decide the sample size.

Despite the table adopted by the Sekaran & Bougie, (2014), the simple technique demonstrated by Hair et al., (2012), which provide an easier guideline to decide the sample size. In the sense, the present study is focused with the table given by Sekaran & Bougie, (2016) when selecting sample size, which are minimum 300 respondents. Moreover, altogether 526 respondents have been selected as a final sample size.

In addition, this research uses survey method because my purpose of the study is to generalize the findings from the sample to population. The rationale for using the deductive approach and survey method is generalizing the findings on total population. In addition when considering the limited time period of data collecting and the cost it is reasonable to apply the survey method for this study (Sekaran, 2000; Malhotra, 2007; Sekaran & Bougie, 2014). Therefore survey method is appropriate for this study.

In the present study, questionnaire was mainly used as an instrument that mainly consists of closed questions, in which respondents are asked to select only one most suitable answer for each questions where numbers assign for each questions (Malhotra, 2000) ranging from 1 for strongly disagreed and 5 for strongly agreed. However, the first part in the questionnaire, comprised with questions regarding demographic data of the respondents.
This study will employ the Structural Equation Modelling (SEM), in which the first step is to specify the measurement model in three stages. Firstly, specify the number of factors or latent variables which is represented by ovals to be hypothesized by the scale’s items constituted by rectangles. Next is to specify the items linked to each factor whereby each item linked to only one latent variable. Thirdly, if the hypothesized model includes multiple factors, then the associations between factors specify are to be represented. In this measurement model specification stage, three types of parameters are desired that are the hypothesized factor loadings, correlation between factors or the loading of a lower order factor in a higher order factor and error variance for each item (Malhotra, 2000; Furr, 2011).

Upon completion of specification phase, analysis begins whereby actual variances and actual covariances are computed using the collected data. This is done to estimate the model’s veracity by creating the implied item variances and covariances and if it emulates the actual variances and covariances, hence, the research model is good. Therefore, indices of model fit are computed. Interchangeably, a good model fit will output small discrepancies. From there on, it will be an interpretation of the results which includes model fit indices such as Goodness of Fit Index, Incremental fit Index, Normed Fit Index, Comparative Fit Index, Non-normed Fit Index, Root Mean Square of Approximation, Root Mean Square Residual and Standardized Root Mean Square Residual. Parameter Estimates. The items’ factor loading, inter-factor associations and error variances is examined. An item with significantly large factor loadings is retained. This will be further discussed in the next section.

IV. DATA ANALYSIS

This study used stem and leaf plots, box plot and whisker diagrams to detect extreme values and outliers in the data set; since the sample is large, the standard value of ±3.0 or beyond was considered as the outlier threshold. After clearing the problematic data, the final sample consisted of 526 questionnaires. Besides, to check the multivariate outliers, Mahalanobis Distance (D2) was used. According to Table 1, the maximum Mahalanobis Distance is 20.41. Since this study consists of four main variables, the standard Chi-Square critical value is 18.47. The alpha value is 0.001.

<table>
<thead>
<tr>
<th>Table 1: Residual Statistics for Four Variables</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Predicted Value</td>
<td>244.81</td>
<td>290.98</td>
<td>267.83</td>
<td>6.609</td>
</tr>
<tr>
<td>Std. Predicted Value</td>
<td>-3.482</td>
<td>3.503</td>
<td>.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Standard Error of Predicted Value</td>
<td>6.993</td>
<td>31.177</td>
<td>14.458</td>
<td>4.198</td>
</tr>
<tr>
<td>Adjusted Predicted Value</td>
<td>247.21</td>
<td>289.28</td>
<td>267.88</td>
<td>6.773</td>
</tr>
<tr>
<td>Residual</td>
<td>-272.505</td>
<td>264.569</td>
<td>.000</td>
<td>153.959</td>
</tr>
<tr>
<td>Std. Residual</td>
<td>-1.763</td>
<td>1.712</td>
<td>.000</td>
<td>.996</td>
</tr>
<tr>
<td>Stud. Residual</td>
<td>-1.770</td>
<td>1.718</td>
<td>.000</td>
<td>1.001</td>
</tr>
<tr>
<td>Deleted Residual</td>
<td>-274.471</td>
<td>266.582</td>
<td>-.052</td>
<td>155.381</td>
</tr>
<tr>
<td>Stud. Deleted Residual</td>
<td>-1.773</td>
<td>1.722</td>
<td>.000</td>
<td>1.002</td>
</tr>
<tr>
<td>Mahal. Distance</td>
<td>.079</td>
<td>20.407</td>
<td>3.992</td>
<td>3.014</td>
</tr>
<tr>
<td>Cook’s Distance</td>
<td>.000</td>
<td>.015</td>
<td>.002</td>
<td>.002</td>
</tr>
<tr>
<td>Centered Leverage Value</td>
<td>.000</td>
<td>.039</td>
<td>.008</td>
<td>.006</td>
</tr>
</tbody>
</table>

Besides, the univariate normality was assessed using skewness and kurtosis values. If the skewness and kurtosis values do not exceed three and ten respectively, then univariate normality can be assumed. In this study, since all the skewness values and kurtosis values of the variables are below one, the univariate distributions are normal.

<table>
<thead>
<tr>
<th>Table 2 – Skewness and Kurtosis Values for the Variables</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumer Perception</td>
<td>-0.003</td>
<td>0.041</td>
</tr>
<tr>
<td>Online Advertising</td>
<td>0.190</td>
<td>-0.772</td>
</tr>
<tr>
<td>Consumer Acceptance</td>
<td>0.265</td>
<td>0.529</td>
</tr>
<tr>
<td>Consumer Satisfaction</td>
<td>-0.344</td>
<td>-0.321</td>
</tr>
</tbody>
</table>
Multivariate normality was tested examining Mardia’s coefficient for multivariate kurtosis. The Mardia’s multivariate coefficient of this study is relatively high. Thus, the data may not be normally distributed. The violation of the multivariate normality assumption is highly affected in confirmatory factor analysis. In the present study, due to the high multivariate normality value, the 1000 bootstrap resampling method was used. Besides, this study examined the homoscedasticity using scatter plots of the standardized residuals. The assumption of homoscedasticity requires that the variance of the dependent variable is the same at all values of independent variable or constant variance of the error term (Sekaran & Bougie, 2009; Hair et al., 2010). The Durbin-Watson value is 1.836 which is in between 1.5 and 2.5; thus, the assumption of independence of the error terms is not violated.

As mentioned earlier, the sample of this research was 526 consumers from the online advertising within Malaysia. The gender split in the sample was almost equal; 48.1% and 51.9% are male and female consumers respectively. In terms of marital status, the married consumers (53.4%) and unmarried consumers (46.6%) were distributed accordingly as well. Besides, the majority (63.7%) of consumers are in the 22-30 years’ age group and 23.2% consumers belong to the 31-40 years age group. The other three age categories only represent 13.1% of the sample. At the same time, the majority of consumers (53.4%) claimed that they have obtained SPM qualification, whilst only 2.1% claimed they have studied up to ordinary level. The survey found that 15.4% respondents have obtained diplomas. However, 27.4% and 1.7% of the consumers possessed degrees and postgraduate qualifications respectively.

In the questionnaire development stage, the reliability test that was performed was explained. Regarding that, the Cronbach’s alpha is the most commonly used coefficient that measures reliability (Hair et al., 2010). Furthermore, they noted that high construct reliability values indicate the existence of internal consistency. This means that all indicators consistently represent the same latent construct. Hair et al., (2010) suggests that the rule of thumb for a good reliability estimate is 0.7 or higher. A reliability estimate of between 0.6 and 0.7 may be acceptable if other indicators of the model construct validity are good. Table 4.8 demonstrates the results of reliability analysis for each variable. According to the table, each reliability coefficient is higher than 0.7 which indicates that the existence of internal consistency is high.

### Table 3 Results of Reliability Analysis

<table>
<thead>
<tr>
<th>Variable and constructs</th>
<th>No. of items</th>
<th>Alpha value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Consumer Perception</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self Efficacy</td>
<td>05</td>
<td>0.800</td>
</tr>
<tr>
<td>Hope</td>
<td>06</td>
<td>0.800</td>
</tr>
<tr>
<td>Optimism</td>
<td>05</td>
<td>0.732</td>
</tr>
<tr>
<td>Resilience</td>
<td>05</td>
<td>0.757</td>
</tr>
<tr>
<td><strong>Online Advertising</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Performance</td>
<td>08</td>
<td>0.836</td>
</tr>
<tr>
<td>Contextual Performance</td>
<td>13</td>
<td>0.887</td>
</tr>
<tr>
<td><strong>Consumer Acceptance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Context</td>
<td>03</td>
<td>0.751</td>
</tr>
<tr>
<td>Content</td>
<td>02</td>
<td>0.881</td>
</tr>
<tr>
<td>Promotion</td>
<td>02</td>
<td>0.849</td>
</tr>
<tr>
<td>Community</td>
<td>02</td>
<td>0.762</td>
</tr>
<tr>
<td>Convenience</td>
<td>02</td>
<td>0.732</td>
</tr>
<tr>
<td>Condition</td>
<td>02</td>
<td>0.705</td>
</tr>
<tr>
<td><strong>Consumer Satisfaction</strong></td>
<td>07</td>
<td>0.832</td>
</tr>
</tbody>
</table>

The initial measurement model for the framework was developed by combining 45 items based on each final individual measurement model. The initial measurement model for the framework model fit indices are demonstrated in Figure 2 and Table 4 respectively; according to the results, all the factor loading values are higher than the required cut-off point of 0.5. By looking at the model fit indices, it can be seen that the model does not fit the data well, as indicated by the significant chi-square fit, \( \chi^2 (925) = 2354.97, p=0.000 \). By observing the absolute fit indices and incremental fit indices, the RMSEA and RMR values are below 0.08 and 0.05 respectively; however, GFI, CFI, NFI, IFI & TLI values are less than the standard cut-off values. Thus, the initial measurement model is not a valid measurement model. Since the model does not fit the data well, the initial model was further evaluated. For this purpose, the modification indices and standardized residual covariance were used.
Table 4 - Model Fit Indices for the Initial Measurement Model of the Framework

<p>| | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>$\chi^2$</td>
<td>df</td>
<td>$\chi^2$/df</td>
<td>GFI</td>
<td>RMSEA</td>
<td>RMR</td>
<td>NFI</td>
<td>CFI</td>
</tr>
<tr>
<td>2354.97</td>
<td>925</td>
<td>2.546</td>
<td>0.835</td>
<td>0.054</td>
<td>0.024</td>
<td>0.777</td>
<td>0.851</td>
</tr>
</tbody>
</table>

Figure 2: Initial Measurement Model for the Framework

The initial measurement model was reanalyzed, as the initial measurement model did not fit the data well. Seven items (TP4, CP13, CA1, CA2, CA11, CS5 and CS6) were removed to enhance the model fit of the final measurement model. The final measurement model was tested using 38 items. The results for the CFA for the measurement model are given in Figure 3 and Table 5. According to the model fit indices depicted in Table 5, the absolute fit indices (GFI = 0.903, RMSEA = 0.046, RMR = 0.020) were within the accepted level, indicating model fit. At the same time, NFI, CFI, IFI and TLI were 0.853, 0.923, 0.924 and 0.915 respectively. These values further confirmed the model fit, since all the values are over the cut-off values for each index.
In addition to the model fit indices, results of confirmatory factor analysis indicate that items for each construct firmly possess convergent validity as the standardized regression weights of all variables are consistent with the cut-off value of 0.5. The results further reveal that the relationship between each variable and factors are statistically significant.

In addition, result also reveals that the four latent constructs are different because the correlations between latent constructs are not larger than 0.8 or 0.9. Larger correlations between latent constructs (greater than 0.8 or 0.9) suggest a lack of discriminant validity (Malhotra, 1997). The maximum correlation (between CP and OA) is 0.637; in this case there is no problem with the discriminant validity. Table 6 demonstrates that the AVE values for all the constructs are greater than 0.5. Further to this the CR values are greater than the AVE values which indicates convergent validity.
### Table 6: AVE and CR Values for the Final Measurement Model

<table>
<thead>
<tr>
<th>Variables</th>
<th>AVE</th>
<th>CR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumer Perception</td>
<td>0.83</td>
<td>0.98</td>
</tr>
<tr>
<td>Online Advertising</td>
<td>0.86</td>
<td>0.96</td>
</tr>
<tr>
<td>Consumer Acceptance</td>
<td>0.51</td>
<td>0.79</td>
</tr>
<tr>
<td>Consumer Satisfaction</td>
<td>0.57</td>
<td>0.83</td>
</tr>
</tbody>
</table>

The Table 6 demonstrated that AVE values for the entire constructs are greater than 0.5. Further to this, the CR values are greater than the AVE values which indicates the convergent validity. Moreover, Table 7 demonstrates the summarised results of the five hypotheses.

### Table 7: The Results of the Hypotheses Testing

<table>
<thead>
<tr>
<th>Hypothesized Paths</th>
<th>SRW</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1: CP --&gt; OA</td>
<td>.596***</td>
<td></td>
</tr>
<tr>
<td>H2: CP --&gt; CA</td>
<td>.548***</td>
<td></td>
</tr>
<tr>
<td>H3: CA --&gt; OA</td>
<td>.119 .040**</td>
<td></td>
</tr>
<tr>
<td>H5: CP --&gt; CS</td>
<td>.493***</td>
<td></td>
</tr>
<tr>
<td>H6: CS --&gt; OA</td>
<td>-.047 .366</td>
<td></td>
</tr>
</tbody>
</table>

Note: *** p-value is statistically significant at the 0.001 level
** p-value is statistically significant at the 0.05 level

Based upon the standardized regression weight and significant level shown in Table 7, the following result in Table 8 was derived for hypotheses.

### Table 8: Decision for Hypothesis One

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1: Consumer Perception is positively and significantly correlated with Online Advertising</td>
<td>Supported</td>
</tr>
<tr>
<td>H2: Consumer Perception is positively &amp; significantly correlated with Consumer Acceptance</td>
<td>Supported</td>
</tr>
<tr>
<td>H3: Consumer Acceptance is positively and significantly correlated with Online Advertising</td>
<td>Supported</td>
</tr>
<tr>
<td>H4: Consumer Perception is positively and significantly related with Consumer Satisfaction</td>
<td>Supported</td>
</tr>
<tr>
<td>H5: Consumer Satisfaction has a positive and significant influence on Online Advertising</td>
<td>Not Supported</td>
</tr>
</tbody>
</table>

This research study mainly focuses on four main variables; Consumer Perception, Online Advertising, Consumer Acceptance and Consumer Satisfaction. The researcher examined the level of Consumer Perception, Online Advertising, Consumer Acceptance and Consumer Satisfaction of managers and non-managerial respondents using a questionnaire.

For the purpose of this study, Consumer Perception is defined as; the positive psychological state of development which is characterised by self-efficacy, hope, optimism and resilience. The data shows that the mean value of Consumer Perception is 3.86; according to the results, there was no remarkable difference between mean scores of each sub-scale. The mean values for each sub-scale are within 3 to 4. This provides evidence that the respondents’ self-efficacy, hope, optimism and resilience are relatively higher in the online advertising. However, gender, marital status, educational qualification and age have had no significant effect on Consumer Perception. According to Sung-Bum Kim et al. (2016), there was no difference between Consumer Perception in relation to gender.

The dependent variable of this research is Online Advertising, according to the statistics; the mean value of Online Advertising is 4.12. Further to this, the age level of respondents has significantly affected Online Advertising; the age group below 21 years old are the highest performing group in the online advertising (M = 4.949, F = 3.598, p < 0.05). However, job position, gender, marital status and education do not have any significant effect on their Online Advertising.
V. CONCLUSION AND RECOMMENDATION

This research has focused on the determinants of consumers’ perception towards online advertising in Malaysia. The results of this study provide evidence that increased Consumer Perception is associated with increased Online Advertising. There is a direct positive, significant relationship between Consumer Perception and Online Advertising of the respondents in the online advertising in Malaysia. It was also found that all sub dimensions of Consumer Perception positively and significantly affect to Online Advertising and its dimensions. The resilience was the strongest predictor of Online Advertising. Besides, the results indicated the significant positive relationships between Consumer Perception and Consumer Acceptance. On the other hand, a significant weak relationship was found between Consumer Acceptance and Online Advertising. However, the Consumer Satisfaction has not correlated significantly with Online Advertising of the respondents in the online advertising in Malaysia.

5.1 Managerial Implications

The results of this research revealed that there is a significant positive relationship between Consumer Perception and Online Advertising. However, the managers of the online advertising consider Consumer Perception of the respondents as an insignificant factor that can influence their Online Advertising. Therefore, it is recommended that managers become highly concerned and acquainted with this newly developed concept because it has a direct relationship with Online Advertising, other work outcomes and work attitudes. Consumer Perception is a collection of positive psychological capabilities of the individual. According to the results, all the dimensions of Consumer Perception have positively and significantly correlated with Online Advertising and its two dimensions. Therefore, it is recommended that managers embrace and concern themselves with each dimension of Consumer Perception of their respondents.

There is no reported research in the online advertising within Malaysia on consumer perception and its effect. So, there should have some academic research on the respective field. According to the findings, Consumer Perception has positively and significantly affected Consumer Acceptance and Consumer Satisfaction. This phenomenon also needs to be tested further. On the other dimension of this, therefore, it is recommended that stakeholders correctly use this new capital to enhance Consumer Satisfaction of the online advertising to the respondents. Thus, it is recommended that advertisement and marketing managers should go beyond the traditional assumptions and consider the new approaches to enhance online advertising to their consumers. Therefore, it can be concluded that the concept of consumer perception and its’ dimensions have direct impact on online advertising.

5.2 Recommendations

Considering the findings of the study, it was found that the Consumer Acceptance and Consumer Satisfaction are not significant predictors of Online Advertising. It stressed that the managers to think about the importance of the factors on Online Advertising than traditionally accepted factors in online advertising. This research found positive significant relationships between Consumer Perception, Consumer Acceptance, Consumer Satisfaction and Online Advertising. Consumer Acceptance and Consumer Satisfaction did not work as mediators. This study was the one of the rare research study which investigated the impact of Consumer Perception within Malaysia according to the reported research literature. The available research knowledge regarding Consumer Perception is based on European and American knowledge and the cross-cultural validation of the construct is much needed. Thus, it is very important to extend this knowledge to the Asian context.

5.3 Study Limitations and Future Study

The present study has provided many potential paths for future researchers. Future studies can be extended to check the applicability and relevance of Consumer Perception within Malaysia using different samples from different sectors, occupations etc. Therefore, future research should focus on examining the antecedents of consumer perception. Since this study was a cross sectional research study, it would be valuable for researchers to conduct longitudinal studies to explore whether Consumer Perception would affect Online Advertising, Consumer Acceptance and Consumer Satisfaction.

ACKNOWLEDGMENT

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REFERENCES


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Improvements and Key Technologies for Low-power Indoor Tracking

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Abstract

To improve the utilization of equipment and labor force, an improved set of low-power indoor tracking equipment was developed based on RF transceivers and microcontrollers. The operating voltage of the system was reset according to the experimental results, this not only reduced the power consumption, but also extended the battery life by driving RF with constant voltage. In the light of the features of DC/DC converter and LDO (Low Drop-Out regulator) converter, a switching circuit was designed to improve the efficiency of the power module. In addition, the low-power modes of the RF module and the microcontroller module were introduced into the system to minimize the power consumption. After the actual test, the system works more reliably and efficiently, the average power consumption drops to 0.4 mA. In addition, the demand for wearing method of the transmitter was introduced to improve the positioning effect based on the experimental results.

Keywords: Indoor Positioning, Low-power, Power Conversion Efficiency, RFID

1 Introduction

Whether in the medical field, the industrial field or the commercial field, the tracking technology has been widespread concern and got a rapid development. Although the outdoor tracking technology has been very mature and began to be widely adopted, the development of the indoor tracking technology[4, 11], as the end of the tracking technology, is relatively slow. Since modern people are increasingly living indoors, the potential applications of the indoor tracking technology is very broad. In many healthcare scenarios, physicians and patients are scheduled to meet in designated examination rooms. This is a joint human and resource allocation problem, requiring knowledge of both personnel locations and whether the exam rooms are occupied. In other words, it is needed to understand the reception of different doctors and master the use of medical equipment and rooms, so as to reduce the waiting time of patients
and provide the most timely treatment.

At present, the commonly used indoor tracking technology is mainly based on the following solutions[12]: Infrared, Ultrasonic, Radio frequency identification (RFID)[5], Bluetooth[3], Wifi[6], ZigBee[8] and Ultra-wideband[9]. The penetration ability and propagation distance of the infrared are both limited, which make its layout complex and increase the application cost. Even when the logo is blocked, the infrared solution will not work properly. Although the tracking accuracy and penetration ability of the Ultrasonic are both excellent, the attention in the air is serious, which make it is not suitable for large places. In addition, the cost of the underlying hardware for ultrasonic solution is very high. The bluetooth-based tracking devices are small in size and low in power consumption, but the stability and anti-interference ability of them are slightly worse. The tracking accuracy with Wifi technology can only reach 2 meters or so at present, which is not suitable for accurate indoor positioning. The signal transmission of ZigBee is sensitive to the multi-path effects and the movement. The ultra-wideband indoor tracking technology has many excellent performance, including strong penetration, outstanding anti-multipath-effects, high security, low system complexity. However, as a new technology, its implementation costs are higher, and its power consumption is too great at this stage, all of which limit its popularity.

Based on RF transceivers, an unobtrusive tracking system for indoor environments has been designed by our group[10]. This system is able to acquire both location and timing data, which are collected by transceiver nodes and then transported by the microcontroller to a host computer. However, as a low-power indoor tracking device, it still has some shortcomings to be improved. The power consumption of the transmitter can be further reduced, and the power conversion efficiency can be further improved. Concluding the directivity pattern of the RF signal, the wearing method of the transmitter also needs to be changed. The present work focuses on taking a variety of measures to extend the battery life and improve the system performance via experimental results.
2 Improved measures

There are three main components for one system unit: a transmitter, a receiver and a host PC. The transmitter is carried by the tracking object, which sends its own characteristic information to the receiver once every second through the RF module. The receiver is placed inside a room, once its RF module gets the characteristic information from the transmitter, the corresponding message will be immediately sent to the host PC through the WIFI module. Then, the host PC will implement the object tracking by the positioning algorithm.

In order to extend the transmitter battery life, it needs not only to reduce the transmitter power consumption, but also to improve the power conversion efficiency. The transmitter power consumption can be reduced by reducing the supply voltage appropriately in hardware or introducing low power sleep mode in software. The power conversion efficiency can be improved by adopting an ingenious conversion circuit. In addition, in order to improve the receiver performance, the original flat antenna has been changed into a cylindrical one. The block diagrams of the improved transmitter are shown in Fig 1, the improved parts are marked with a yellow background.

2.1 Improvements in hardware design

The improvements of the hardware part mainly lie in the following two aspects:

1. The operating voltage of the transmitter was reset to extend the battery life. In low-power systems, reducing the operating voltage is one of the effective ways to reduce the systems power consumption. In addition, using a fix voltage to drive the RF module not only guarantees its transmission power constant, but also effectively extends the battery life [7]. Therefore, the operating voltage of the transmitter is reduced from the original 3.3V to 2.5V which is slightly higher than the cut-off voltage of the battery.

2. The two-stage power conversion and switching circuit was designed to improve
the power conversion efficiency.

The transmitter is powered by a standard lithium battery with a maximum output voltage of 4.2V and a cut-off voltage of 2.4V. Since the battery voltage will change with the ambient temperature, the load current and the residual charge, the conversion efficiencies of the DC/DC converter and the Low Dropout Regulator (two conversion devices commonly used in low-voltage appliances) will change with the provided voltage and load current, therefore, it is needed to design an ingenious circuit module to improve the power conversion efficiency from the battery to the electrical appliance.

The first stage voltage conversion circuit is shown in Fig 2. The battery voltage is converted to 2.7V by a synchronous step-down DC/DC converter (abbreviated as DC/DC) or Low Dropout Regulator (abbreviated as LDO). Wherein the switching between the DC/DC and the LDO is achieved by the DC_on signal, and the output of the DC/DC is set to be slightly higher than that of
The DC_on signal generation circuit is shown in Fig 3. U1 is the voltage monitoring chip and the monitoring voltage is adjusted to 3.3V by setting the ratio of R1 to R2. If the battery voltage is higher than 3.3V, the reset signal will be high, otherwise it will be low. The Run signal represents the working status of the microcontroller, when the microcontroller is in normal operation, this signal is high; when the microcontroller is in sleep mode, this signal is low. The reset signal and the Run signal are connected to the two inputs of an OR logic gate built by BAT54C. The output of the OR logic gate is the DC_on signal. Thus, when the battery voltage is higher than 3.3V or the microcontroller is in normal operation, the DC_on signal is high and the DC/DC is selected. Since the LDO output voltage is set to be slightly lower than that of the DC/DC, the LDO internal circuit will automatically stop the conversion. The experimental result shows that there is no sink current at the output of the LDO. On the other hand, when the battery voltage is lower than 3.3V or the microcontroller is in sleep mode, the DC_on signal is lower, the DC/DC stops working and the LDO outputs the conversion voltage. Similarly, it has been experimentally verified that there is no sink current at the output of the DC/DC.

This solution combines the advantages of the DC/DC and LDO, avoiding the low conversion efficiencies of LDO (when the battery voltage is high) and DC/DC (when driving light loads).

The second stage voltage conversion circuit is shown in Fig 4. The output voltage of the first stage is converted into 2.4V via an LDO chip, which is supplied to the microcontroller and the RF module. In addition, the power quality can be improved and the power ripple can be reduced through the second stage. According to the conversion characteristics of LDO, the conversion efficiency of this stage is about 90%, that is, the ratio of the output voltage to the input voltage.
Figure 2: First level of power conversion

Figure 3: Control circuit
2.2 Improvements in software design

Since the receiver and the host PC are powered from a plug, whose program flow chart are respectively shown in Fig 5 and Fig 6, therefore, the software improvements will be mainly placed in the battery-powered transmitter. The multi-threaded technology was used in the receiver and host PC code.

The improved program flow chart of the transmitter is shown in Fig 7. The power consumption can be effectively reduced by enabling the sleep mode of the MCU and RF modules in the working gap of the transmitter. It can be seen from the datasheet that the current consumption of the MCU module is reduced to one thousandth of the original (from active 8MHz to power-down mode with WDT enabled), and for the RF module, this value is about 4 percent (from transmit mode to idle mode) [1, 2]. It is worth noting that there is a need to provide sufficient response time for the state transition of the RF module, the wake-up time is about 1.5ms.
Figure 5: Program flow chart of the receiver
Figure 6: Program flow chart of the HOST PC
Figure 7: Program flow chart of the transmitter
3 Experimental results

Since the voltage resetting, power conversion and sleep modes were adopted to improve the performance of the transmitter, the experiments mainly focus on the following aspects: at first, the effect of reducing the operating voltage on the transmitter; secondly, the power consumption of the improved system; finally, based on the experimental results, several suggestions for the way of wearing were given due to the directionality of the RF signal.

3.1 Experimental setup

1. The effect of reducing the operating voltage on the transmitter
   In order to more obviously and realistically illustrate the launch performance at different operating voltage, we use the signal received by the corresponding receiver as the criterion, that is, the more signal received, the better launch performance, vice versa.
   However, the signal received by the corresponding receiver is not only determined by the launch performance of the transmitter, but also on the distance and angle between them, as well as the gain setting within the transmitter. Therefore, we first set the gain within the transmitter to -18dB (the minimum value), and fixed the angle between the transmitter and the corresponding receiver. Then, the performance of the transmitter at different operating voltage was studied by calculating the packet acceptance rate within the receiver at different distances.
   Since the supply range of the RF module is 1.9V to 3.6V and the power supply range of a lithium battery is about 2.4V to 4.2V, the actual operating voltage of the transmitter varied from 2.4V to 3.6V, which provided by an external linear power supply.

2. Power consumption
   This test can be divided into two parts, the first is about the conversion effi-
ciency of the two stages of voltage conversion circuit; the second is about the overall power consumption. For the first point, appropriate resistances were used to simulate the different current consumption. Since the current consumption of the transmitter in active state is about 14 mA, a resistance of about 190 ohm is connected directly to the output of the voltage conversion circuit to simulate this situation. Whereas a resistance of about 7.2 Kohm is selected to simulate the load current (about 330 µA) in sleep mode. For the second point, the current in sleep mode will be compared to the quiescent current of the previous system which has not applied sleep mode in RF module. Similar to the experiment 1, the transmitter was powered by an external linear power supply for easily being adjusted.

3. Wearing method
Since the emission angle of the RF module is not omnidirectional with 360 degrees, the angle between the transmitter and receiver would affect the transmission of the wireless signals. Similar to the first experiment, we studied the effect of the angle by observing the packet acceptance rate at different distances, with a fixed the operating voltage during the experiment. In this experiment, there are three angles were selected, which are the transmitter facing the receiver, perpendicular to the transmitter and back to the receiver.

3.2 Results
1. The effect of reducing the operating voltage on the transmitter
The experimental results are shown in Tab 1, it can be seen that, when the operating voltage is gradually reduced, there is almost no attenuation of launch performance within the range of 18 feet, which is far greater than the length of a common treatment room. Therefore, the operating voltage can be set to
Table 1: Package acceptance rate at different operating voltages

<table>
<thead>
<tr>
<th>Distance (ft)</th>
<th>3.60V</th>
<th>3.40V</th>
<th>3.20V</th>
<th>3.00V</th>
<th>2.80V</th>
<th>2.60V</th>
<th>2.40V</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
<td>98.33</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td>10</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
<td>96.67</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td>12</td>
<td>88.33</td>
<td>86.67</td>
<td>86.67</td>
<td>93.33</td>
<td>91.67</td>
<td>85.00</td>
<td>90.00</td>
</tr>
<tr>
<td>14</td>
<td>100.00</td>
<td>100.00</td>
<td>98.33</td>
<td>96.67</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td>16</td>
<td>98.33</td>
<td>98.33</td>
<td>100.00</td>
<td>100.00</td>
<td>90.00</td>
<td>90.00</td>
<td>96.67</td>
</tr>
<tr>
<td>18</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
<td>98.33</td>
<td>100.00</td>
<td>100.00</td>
</tr>
</tbody>
</table>

through the field measurement, the current consumption in sleep mode is about 360 µA, which is far less than the previous consumption of about 730 µA. With the decrease of the current consumption in sleep mode, the average power consumption of the transmitter drops to 0.4 mA.

3. Wearing method

The experimental results are shown in Tab 2. It can be seen that the angle has...
Figure 8: Conversion efficiencies of LDO and DC/DC in sleep mode

Figure 9: Conversion efficiencies of LDO and DC/DC in active mode
Table 2: Package acceptance rate at different angles

<table>
<thead>
<tr>
<th>Angle</th>
<th>8ft</th>
<th>10ft</th>
<th>12ft</th>
<th>14ft</th>
<th>16ft</th>
<th>18ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face to face</td>
<td>100.00</td>
<td>100.00</td>
<td>90.00</td>
<td>100.00</td>
<td>96.67</td>
<td>100.00</td>
</tr>
<tr>
<td>Perpendicular</td>
<td>8.33</td>
<td>85.00</td>
<td>83.33</td>
<td>98.33</td>
<td>98.33</td>
<td>91.67</td>
</tr>
<tr>
<td>Back to face</td>
<td>93.33</td>
<td>96.67</td>
<td>28.33</td>
<td>51.67</td>
<td>96.67</td>
<td>56.67</td>
</tr>
</tbody>
</table>

da great impact on the transmission of the wireless signal, the best way is to keep the transmitter facing the receiver. Therefore, in order to achieve a better tracking results, we recommend using a suspension way to wear the transmitter, so as to increase the probability of the best angle. On the other hand, it is also recommended to use a cylindrical antenna instead of the previous flat one and place it on the ceiling.

4 Discussion and conclusions

Conclusions:

There are three improvements are implemented to extend the battery life based on the previous indoor tracking system, and a suggestion about how to wear and intall the equipment is given to enhance the performance according to the experimental results.

1. The operating voltage of the transmitter was redesigned to reduce the power consumption based on the experimental result that the reduction in operating voltage has no effect on the launch performance.

2. A suitable power conversion circuit was designed to improve the conversion efficiency and prolong the battery life based on the different working natures of LDO and DC/DC when driving different load currents.
3. The low-power mode, i.e. sleep mode, was introduced into the RF module and the microcontroller module to reduce the system quiescent current, so as to reduce the average power consumption.

Discussion:
In terms of future improvements, it needs to be noticed that there is a greater attenuation for each operating voltage and each angle at the distance of 12 feet, which is caused by the multipath effects of wireless signals. A further transformation of the receiver needs to be used to overcome this physical impact effectively. On the other hand, the possibility of applying the indoor tracking system to the intrinsically safe environment, such as the mine, is further improved with the further reduction of power consumption.
References

[1] ATMEGA328P.


An Alternative Material for Tall Building’s Glass Façade in Tropical Countries

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Abstract - Facade systems, as one of the most complex elements of building, are largely responsible for both the energy-performance and overall aesthetic qualities of a building. With day-to-day innovation in materials & modern technologies, various different materials other than glass are available which can be used for facade of building. Ethylene Tetra Fluoro Ethylene (ETFE) is one of the most exciting materials in today’s design industry and has set the construction world alight with the potential it offers. This research is about study of ETFE; An innovative material & its application as facade material for tall buildings in tropical countries.

Index Terms - Glass façade, Tall building, Tropical countries

I. INTRODUCTION

Façades play a very important role in the quality of a building. It forms the barrier between the internal space and the outside climate. Structurally the façade line is the most efficient line for placing the main structural elements. The façade is the medium through which the interaction takes place between the activities inside and outside. The image of a building, and therefore also of the users, is reflected through the design of the façade. In this case it is very important to use proper material for facade of tall buildings because not only they affect cost of building but also become a key stone in selection of structural system for building. Along with these, facade of building should also respond to its surroundings and hence designing facade for a tall building becomes an important aspect. There are several materials which are used for facade of tall buildings. With day to day innovations, variety of different materials are available having better aesthetic quality and energy performance than conventional materials. One of them is Ethylene Tetra Fluoro Ethylene (ETFE), discovered in 1950’s, a polymer compound having distinctive properties than others, thus is an interesting material in design industry. It is a transparent polymer which weights approximately 1% of glass for same area and hence is easy to transport & erect[1]. Light weight of material helps to minimize sizes of structural member and thus reduces cost of construction. It is an inflammable material having very high melting point and does not produces droplets on burning[2]. There are many more features of ETFE over traditional glass and hence this research attempts to highlight those advantages.

II. BACKGROUND

Originally invented by DuPont as an insulation material for the aeronautics industry, ETFE was not initially considered as a main-stream building material, its principle use being as an upgrade for the polythene sheet commonly used for green house poly tunnels. The advantages of its extraordinary tear resistance, long life and transparency to ultra-violet light off-set the higher initial costs and 20 years later it is still working well. It wasn’t until the early 1980s, when German mechanical engineering student, Stefan Lehnert, investigated it in his quest for new and exciting sail materials, that its use was reconsidered. Although discounted for Stefan’s original purpose, he saw its strength, high light transmission and structural properties as an advantage to the construction industry and started to develop the systems we see today[3].

III. AIM OF RESEARCH

Aim of this research is to study properties of ETFE and its advantages when used as facade of tall buildings in tropical countries.

IV. OBJECTIVE & METHODOLOGY

In order to achieve the aim various objectives and their corresponding methodology have been set.

- To study ETFE; an innovative material-
  This will include study of secondary data available from book, magazines, internet and previous research paper published which explains this new material.
- To Review ETFE foil and cushions as suitable replacement for Glass-
  This will include comparison between glass and other conventional facade material with ETFE, based on available data and from this conclusion will be drawn

V. INTRODUCTION TO ETFE

ETFE is a melt-process able fluoropolymer, belonging to the sub-category of polymer materials called thermoplastics. This category relates to polymer materials that soften and become easily shaped and bent when heated Ethylene tetra fluoro ethylene (ETFE) is a fluorine-based plastic. It was designed to have high corrosion resistance and strength over a wide temperature range. ETFE has a relatively high melting temperature, excellent chemical, electrical and high-energy radiation resistance properties[4]. Following are some of the features which makes ETFE special,

1. Light Weight of material
As ETFE film is lightweight, it requires less structural steel to support it, less materials results in a much lighter carbon footprint. Greater design capabilities due to the lightweight and flexibility of the ETFE film. Unlike glass, ETFE film is shatterproof, thus itself it is an advantage.

2. Excellent Light Transmission
ETFE film produces a bright and open space that can emulate the outdoors. Due to the high transmittance of daylight, lighting costs can be reduced which in turn will contribute to saving energy. By choosing a specific ETFE film, light transmission can be controlled to best suit the exposed area.

3. Superior Durability & self cleaning property
ETFE is highly resistant to chemical damage, as well as being resilient to wild weather. ETFE film can retain well its strength for over 20 years whilst also retaining its transparency with its self-cleaning capabilities.

4. Insulation Property
When ETFE film is used in the two or three layer model, it can be a great source of insulation for the inside of the structure. Along with this new technology has arrived of using various infill material within ETFE cushion.

5. Eco friendly
ETFE is recyclable; once it has been removed from a structure it can be recycled back into useable ETFE products. ETFE is a lightweight fabric, which requires less fabrication than traditional building materials, reducing CO2 emissions in the air.

6. Fire resistance performance
ETFE film has passed International standards in fire resistance. It is entirely anti flammable, i.e. it does not catch fire nor does it spreads fire through it. Beyond this it does not produce droplets caused by fire.

VI. FURTHER DEVELOPMENT
ETFE is also available with fritting i.e. insulated coating material above cushion. This helps to control light gain and thus to control heat intake in building. This will reduce energy consumption within building, which is otherwise used to achieve desirable interior environment[5]. Now a days we have option to control transparency of cushion and noise insulation as per requirement of space. ETFE does not produce much glare as compared to conventional glass, thus gives quite pleasant external as well as internal view[6]. Few experiments are going on to check performance of ETFE by replacing air bound between two layers of cushion with another material. If successfully done, will further help to improve performance of material and ultimately the building[7].

VII. COMPARISON WITH OTHER MATERIALS
Based on secondary data available from various sources we can compare ETFE with other conventional materials which are generally used for facade of buildings in tropical countries,

<table>
<thead>
<tr>
<th>Property</th>
<th>Laminated Safety glass 13.5 mm</th>
<th>Insulated Double glass 24 mm</th>
<th>PVC</th>
<th>Polycarbonate 16 mm wall</th>
<th>PTFE</th>
<th>ETFE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life span</td>
<td>10-15 yr</td>
<td>10 years</td>
<td>15+ years</td>
<td>15+ years</td>
<td>30+ Years</td>
<td>30+ years</td>
</tr>
<tr>
<td>Self weight</td>
<td>36 kg/m2</td>
<td>30 kg/m2</td>
<td>1 kg/m2</td>
<td>3.3 kg/m2</td>
<td>1 kg/m2</td>
<td>1 kg/m2</td>
</tr>
<tr>
<td>Panel size</td>
<td>3.2 x 6 m</td>
<td>3.2 x 6 m</td>
<td>Up to 14 m</td>
<td>1.4 x 12 m</td>
<td>Up to 4 m</td>
<td>10 x 10 m</td>
</tr>
<tr>
<td>Weight of support</td>
<td>55-75 kg/m2</td>
<td>55-75 kg/m2</td>
<td>30-40 kg/m2</td>
<td>35-45 kg/m2</td>
<td>30-40 kg/m2</td>
<td>25-30 kg/m2</td>
</tr>
<tr>
<td>U value</td>
<td>5.5 W/m2K</td>
<td>2 W/m2K</td>
<td>4.6 W/m2K</td>
<td>2.3 W/m2K</td>
<td>4.6 W/m2K</td>
<td>1.18K/m2K</td>
</tr>
<tr>
<td>Light gain</td>
<td>85 %</td>
<td>76 %</td>
<td>10-15%</td>
<td>63 %</td>
<td>15-20%</td>
<td>0-90%</td>
</tr>
<tr>
<td>Heat gain</td>
<td>0.69</td>
<td>0.67</td>
<td>0.18</td>
<td>0.53</td>
<td>0.18</td>
<td>0.0 - 0.8</td>
</tr>
<tr>
<td>Noise gain</td>
<td>moderate</td>
<td>low</td>
<td>high</td>
<td>moderate</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>Fire resistance</td>
<td>Non combustible</td>
<td>Non combustible</td>
<td>Non combustible</td>
<td>Low</td>
<td>Non combustible</td>
<td>Non combustible</td>
</tr>
<tr>
<td>Smoke removal</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>available</td>
</tr>
<tr>
<td>External cleaning</td>
<td>Regular manual</td>
<td>Regular manual</td>
<td>Regular manual</td>
<td>Self but unsightly</td>
<td>Self cleaning</td>
<td></td>
</tr>
<tr>
<td>Repair</td>
<td>Removal of entire panel</td>
<td>Removal of entire panel</td>
<td>Patch repair</td>
<td>n/a</td>
<td>n/a</td>
<td>On spot patch repair</td>
</tr>
<tr>
<td>Grass growth</td>
<td>Good</td>
<td>Good</td>
<td>Poor</td>
<td>Poor</td>
<td>Moderate</td>
<td>Excellent</td>
</tr>
<tr>
<td>Ease of installation</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Good</td>
<td>Moderate</td>
<td>Good</td>
<td>Excellent</td>
</tr>
<tr>
<td>Environmental credentials</td>
<td>Moderate</td>
<td>Moderate</td>
<td>Good</td>
<td>Moderate</td>
<td>Good</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

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VIII. ADVANTAGES OF USING ETFE FOR BUILDING FACADE

Due to light weight of material it is easy to handle, transport, erect on position and even fix it. ETFE have a long life span thus no need to replace unless it is seriously damage, and even if need so one can replace entire panel on the spot. Thus no disturbance to surrounding framing members. Cost of construction can be controlled by replacing glass facade with ETFE. Further ETFE have very high melting point and even at burning it does not produces droplets. It can hold fire up to certain temperature after which the air cushion breaks up, evaluating smoke generated by fire outside, and thus helps to save human life to great extend[8]. Self cleaning property of material reduces frequency of building maintenance. Since light transmission through ETFE is good, growth of grass in landscape area inside building is excellent. When we consider all these point, surely ETFE have many advantages over traditional building facade material.

IX. LIMITATIONS

This research is entirely based on secondary data source and no actual experiment was carried out during research period. This is just a theoretical analysis, however its real life model example is yet to come.

X. CONCLUSION

ETFE cushions have been studied in the pursuit of a replacement to glazing, as a solution to the disadvantages associated with use of glass, such as its fragility, weight and behavior towards heat transmission. Glass presents high transmission of near Infra-Red radiation, causing an increase in cooling requirements during warm weather, and regular cooling due to tropical climatic conditions. The excessive use of glazing also increases the embodied energy and thus elevate the building maintenance cost and affect global environment. This can be minimized by replacing glass panel by ETFE. Furthermore, the geometry of the building is often an obstacle to the use of glass which is not case with ETFE, thus designer have freedom to explore various forms. research aims to replace glass by ETFE in order to overcome all these consequences which a tall building face in tropical countries.

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Correlation between Body Mass Index and Blood Pressure

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***Professor of Physiology, Faculty of Medicine, the National Ribat University, Khartoum, Sudan

Abstract- Background: There is a global increment in the prevalence of increased body mass and its co-morbid conditions such as but not limited to hypertension. Many studies have been conducted to detect the essence of the relationship between the body mass index (BMI) and the systolic pressure as well as the diastolic blood pressure.

Methods: An extensive PubMed search has been conducted for researches in regards to the nature of the relationship between the blood pressure (BP) and body mass index (BMI).

Result: In a period of a decade (from 2006 up to 2016) using (body mass index, blood pressure) as key words, 20 papers have been recovered and addressed the relation in question. The results from these papers suggest a relationship between the body mass index and tendency for blood pressure increment. However, this association is not always linear; and even could be reversed as was suggested by one study.

Conclusion: Upon analyzing, body mass index is a crucial contributor that affects the levels of blood pressure among many different ethnic groups.

Index Terms- Body mass index, blood pressure levels

I. INTRODUCTION

Currently, there are no known studies investigating the relationship between blood pressure and the body mass index among the widely diverse population such as the Sudanese population. The normal values of both the systolic and diastolic blood pressures adopted in clinical practice are taken from non-Sudanese subjects based on numbers used internationally. In our opinion, these numbers are expected to be different because of the different diet, climate, and genetic makeup and exercise program among the participants.

Results

<table>
<thead>
<tr>
<th>Author</th>
<th>Type of Study &amp; Year</th>
<th>Sample Size</th>
<th>Results &amp; Conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nadia Danon-Hersch</td>
<td>Cross sectional study in 1989 (n=1081), 2004 (n=1255)</td>
<td>Results: Among patients, who are not on treatment, it has been realized that an increment of BMI by 1 kg/m² was associated with a correspondent elevation of systolic and diastolic pressures by 2.0/1.5 mm Hg respectively in 1989 but only 1.3/1.0 mmHg in 2004. Conclusion: The relationship between the values of systolic and diastolic blood pressures and BMI was not statistically significant.</td>
<td></td>
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</tbody>
</table>

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<table>
<thead>
<tr>
<th>Authors</th>
<th>Study Design</th>
<th>Study Population</th>
<th>Year</th>
<th>Sample Size</th>
<th>Results</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seychelles. 2007</td>
<td>BMI and those BP was comparatively weaker in 2004 than those observed in 1989, regardless of treatment and age, and among both lean and overweight populations.</td>
<td>F Tesfaye (2)</td>
<td>cross-sectional descriptive design in Ethiopia, Vietnam and Indonesia, 2007</td>
<td>7675</td>
<td>Results: An increment of both BMI and BP was noticed in respect to the Socio economic status in all three countries. A rising prevalence of overweight/obesity based on the BMI was observed among Indonesian women with a percentage of (25%) compared to the male population with only (10%); however, a decreased BMI was noted in Ethiopia and Vietnam, with respective percentages of 33 to 43%. Conclusion: A strong positive correlation between the BMI and both the systolic and diastolic pressures was noted in the three populations, with a correlation coefficient (r) between 0.23 and 0.27, Po0.01.</td>
<td></td>
</tr>
<tr>
<td>Francesco P. Cappuccino (3)</td>
<td>Cross section, Africa, Caribbean, the United Kingdom and the United States. 2008</td>
<td>18,072 participants</td>
<td>Results: The nature of the relationship between both systolic and diastolic blood pressure and BMI documented in this study was positive. Conclusion: The observed values of the Blood pressure and BMI levels had a wide variation among African population. The effect of BMI on blood pressure levels diminishes as BMI increases.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Violet Kankane Moselakgomo (4)</td>
<td>Cross section, South Africa. 2012</td>
<td>1,172</td>
<td>Results: A positive correlation between the blood pressure and the body mass index was detected with a (p&lt;0.001) Conclusion: The Blood pressure rises as the age increased regardless of the gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L.N. Aachie (5)</td>
<td>Cross sectional study in Zaria, Northern Nigeria. 2012</td>
<td>165</td>
<td>Results: This study demonstrated a positive correlation between waist circumference and the body mass index (p&lt;0.05). Conclusion: When analyzed BMI against the diastolic pressure, a positive correlation with observed, however it was not significant with a (p&gt;0.05)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aina Emaus (6)</td>
<td>Cross sectional study, Norway. 2011</td>
<td>12,900</td>
<td>Results: The study included representatives from both genders. The mean BMI was 27.1 kg/m2 among the male sub population was and 25.1 kg/m2 for women. Mean arterial blood pressure (MAP) was 92.4 mm Hg for men and 86.0 mm Hg for women. The proportion attributed to the class pre-hypertensive/hypertensive was lower in women with a percentage of 33% compared to 56% for men. When genders were classified as medium and high according to the cardiorespiratory fitness denoted as (CRF) combined varied significantly (p &lt; 0.0001) by BMI level (&lt; 25 or ≥ 25 kg/m2). It has been showed that an increment in fitness contributes to the reduction of blood pressure among overweight and obese from the male subpopulation (p trend = 0.03);the increased fitness also tended to make reduction in blood pressure among normal weighted female counterpart (p trend = 0.01). Conclusion: Among healthy 40-44 year old men and women included in this study, BMI was positively</td>
<td></td>
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</tbody>
</table>
correlated to the blood pressure, whereas CRF was negatively associated with it. These results may suggest that BMI may be a more valuable predictor than CRF for systolic blood pressure in both genders. It does not mean, however, cardiorespiratory fitness and weight control are not as much as important when treating or preventing hypertension.

<table>
<thead>
<tr>
<th>Olumide Abiodun (7)</th>
<th>Cross sectional study, Nigeria 2014</th>
<th>776</th>
</tr>
</thead>
</table>

**Results:** The observed mean BMI in this study was in the overweight range, 25.49±5.15 kg/m² and detected higher in women. 62.8% of the participants displayed an elevated waist hip ratio denoted as (WHR) in an abnormal manner. The values of Random blood sugar (RBS), systolic blood pressure (SBP) and diastolic blood pressure (DBP) showed a significant increment in relation to increasing BMI with the respective p values (p=0.000, p=0.000 and p=0.007). These values were also higher with significance in persons with abnormally elevated WHR than those with normal WHR (p=0.000, p=0.000 and p=0.000 respectively). It is worth noting, that, overweight individuals had a higher RBS than that in obese population. A significant correlation between BMI and RBS (0.083, p=0.020), SBP (0.206, p=0.000) and DBP (0.152, p=0.000). However, a slightly stronger correlation between WHR and RBS (0.093, p=0.009), SBP (0.273, p=0.000) and DBP (0.217, p=0.000) was observed.

**Conclusion:** The study conducted in Nigeria and concluded that BMI and WHR are positively correlated with RBS and blood pressure. The Nigerian population is therefore at risk of the amalgamation of overweight/obesity/hyperglycemia and hypertension.

<table>
<thead>
<tr>
<th>Varshitha A (8)</th>
<th>Cross section, India. 2015</th>
<th>100</th>
</tr>
</thead>
</table>

**Results:** The study showed that the means of both the systolic and diastolic blood pressure were found to be increased in men compared to women. The mean BMI displayed the same tendency to be higher in males. Systolic, diastolic blood pressure and BMI of males was found to be statistically higher than females.

**Conclusion:** The study concluded that the correlation between the BMI and both values of the blood pressure was significant positive with a (p<0.01) of many unaddressed factors such as (genetics, diet, environments, response to treatment and so on).

V. DISCUSSION

The blood pressure as a physiological parameter is influenced by so many factors which include BMI, physical activity, age, ethnic background, diet and smoking as well. There was a statistical significance in the association between the variables under scrutiny (BMI, Systolic and Diastolic blood pressure). It is worth mentioning, however, that this correlation does not always display a pattern of linearity. In fact, it could get weakened [1], or even reversed (the lower BMI and higher blood pressure [2]. One of many explanations for this is the presence

VI. CONCLUSION

Body mass index is an important determining factor of the values of blood pressure among different ethnic populations. There is a need for establishing the relation with a mathematical formula so as to calculate the normal blood pressure for an adult according to the personalized BMI.
REFERENCES


AUTHORS

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Normal values of Hemoglobin A\textsubscript{1c} (Hb A\textsubscript{1c}) in non-diabetic adults

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\textsuperscript{**} Lecturer, Department of Physiology, Faculty of Medicine, Napata College, Khartoum, Sudan
\textsuperscript{***} Professor of Physiology, Faculty of Medicine, the National Ribat University, Khartoum, Sudan

Abstract - Background: At present, there are no studies done to investigate the normal values of Hb A\textsubscript{1c} in Sudanese population. The level of Hb A\textsubscript{1c} for Sudanese population is borrowed from international references.

Objectives: The objective of this article is to investigate the normal levels of Hb A\textsubscript{1c}, and the factors that may affect its value.

Methods: Extensive internet search has been done on research regarding the normal values of Hemoglobin A\textsubscript{1c} and factors affecting them in non-diabetic Adults.

Result: Normal level of Hb A\textsubscript{1c} obtained from all previous studies showed a value of 3.6\% as minimum and 6.5\% as maximum value. Significant racial/ethnic differences in Hb A\textsubscript{1c} levels were observed; these differences are significantly higher in people from African descent than in Caucasians.

Discussion: Hb A\textsubscript{1c} is influenced by many risk factors; these include BMI, physical activity, age, ethnicity, diet and smoking.

Conclusion: Normal level of Hb A\textsubscript{1c} from all previous studies showed a value of 3.6\% as minimum and 6.5\% as maximum value and seemed to be affected by many risk factors.

Index Terms- Hb A\textsubscript{1c}, Normal value, non-diabetic Adults

I. INTRODUCTION

Currently, there are no known studies conducted to investigate the normal reference range of Hb A\textsubscript{1c} in Sudanese population. These normal reference ranges of Hb A\textsubscript{1c} for our population in the clinical practice are taken from non-Sudanese subjects depending on the international American and British Guidelines.

Most of the studies about the normal Hb A\textsubscript{1c} were done in Western countries. For these countries the different environment, ethnic groups, nutritional habits and body mass indices, play a significant role in determining the Hb A\textsubscript{1c} levels compared to Sudan.

II. METHODS

An extensive internet search regarding the normal values as well as the factors affecting Hemoglobin A\textsubscript{1c} in non-diabetic Adults, has been conducted.

Consulting the following Web site: National Center for Biotechnology Information NCBI, PubMed, Google Scholar and using the following key words: Normal Hb A\textsubscript{1c}, Normal Hb A\textsubscript{1c} in non-diabetics, physiological factors affecting Hb A\textsubscript{1c}.

The search covered the past 28 years and 13 papers were located and retrieved.

III. RESULTS

First author | Type of study – country | Sample size | Date | Results and main conclusion
--- | --- | --- | --- | ---
Modan\textsuperscript{1} | Cross section – Israel | 648 | 1988 | Correlation of Hb A\textsubscript{1c} with daily caloric intake and physical exercise was not established. No significant correlation between BMI and Hb A\textsubscript{1c} was observed. A small, yet significant elevation in Hb A\textsubscript{1c} was related with smoking (7.1 vs. 6.8\%, \textit{P}<.01)

Simon\textsuperscript{2} | Cross section - United Kingdom | 3240 | 1989 | Mean of normal distribution of Hb A\textsubscript{1c} in men is 5.03\% with mean (SD) of (0.53) Obese persons (defined as BMI > 28 kg/m\textsuperscript{2}) were found to have higher level of Hb A\textsubscript{1c} however after adjustment for age, the correlation between the two values (BMI and Hb A\textsubscript{1c}) was no longer significant.

K. Wiener \textsuperscript{3} | Cross section - Liverpool, UK | 399 | 1999 | No significant correlation between HbA\textsubscript{1c} and age; hence, they cannot see the need for age-specific reference ranges for Hb A\textsubscript{1c}.

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<table>
<thead>
<tr>
<th>Study</th>
<th>Cross Section</th>
<th>Sample Size</th>
<th>Year</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boltri et al.</td>
<td>Cross section - USA</td>
<td>4880</td>
<td>1999 - 2000</td>
<td>Hb A1c level showed significant racial/ethnic dependency where it was significantly higher in Blacks and Hispanics.</td>
</tr>
<tr>
<td>Boeing et al.</td>
<td>Cross section - Germany</td>
<td>1773</td>
<td>2000</td>
<td>There is a direct relationship between risk of increased Hb A1c and the intake of high energy and energy-adjusted saturated fats. Hb A1c levels did not correlate with physical activity. Obesity was related with higher Hb A1c levels.</td>
</tr>
<tr>
<td>Sargeant et al.</td>
<td>Cross section - Cambridge, UK</td>
<td>2704</td>
<td>2000</td>
<td>A dose-response relationship between HbA1c levels and the daily smoked cigarettes was observed. A positive association with total smoking exposure as measured by pack-years was detected as well.</td>
</tr>
<tr>
<td>Gulliford et al.</td>
<td>Cross section - England</td>
<td>9772</td>
<td>2001</td>
<td>The study detected a Hb A1c mean of normal distribution in general population to be 6.34% with mean (SD) of (0.85). Found a 0.180% lower Hb A1c in participants who exercise compared to those with no or little physical activity; Hb A1c seemed to be correlating with the level of physical activity. Smoking had a direct association with higher Hb A1c levels.</td>
</tr>
<tr>
<td>Pani et al.</td>
<td>Cross section - UK</td>
<td>2473</td>
<td>2000-2004</td>
<td>They stated that the results established clearly an Hb A1c increment in correlation with age, despite the multivariate adjustments for sex, fasting, and 2-hour post-load glucose; and suggested that other factors not related to glycaemia may weigh in the relationship of Hb A1c with age.</td>
</tr>
<tr>
<td>International Expert Committee</td>
<td>Cross section</td>
<td>-</td>
<td>2009</td>
<td>Hb A1c is helpful diagnostic value in diabetes the diagnose can be established when the Hb A1c level is 6.5% and more.</td>
</tr>
<tr>
<td>International Federation of Clinical Chemistry and Laboratory Medicine (IFCC)</td>
<td>Cross section</td>
<td>2009</td>
<td>The non-diabetic 'normal' range being 4-6%.</td>
<td></td>
</tr>
<tr>
<td>Ziemer et al.</td>
<td>Cross section - USA</td>
<td>1581</td>
<td>2010</td>
<td>Hb A1c levels were found to be higher in people from African descent than in Caucasian people across the full spectrum of glycaemia after adjustments for plasma glucose and other factors known to correlate with Hb A1c levels.</td>
</tr>
<tr>
<td>Nathan et al.</td>
<td>Cross section - London - UK</td>
<td>78</td>
<td>2011</td>
<td>Normal range of Hb A1c test for non-diabetic people is between 3.6 – 5.5%.</td>
</tr>
<tr>
<td>WHO report</td>
<td>-</td>
<td>-</td>
<td>2011</td>
<td>Hb A1c of 6.5% was recommended as the diagnostic cut-off point for diabetes.</td>
</tr>
</tbody>
</table>

V. DISCUSSION

From all the studies done about normal level of Hb A1c, the minimum value was 3.6% and the maximum value was 6.5% (2,7,10,12).

There are significant racial/ethnic differences in Hb A1c levels, which are significantly higher in Blacks than white. (4-11)

Hb A1c increased with all the known risk factors for diabetes (e.g., obesity) (2,5), and decrease with increase in physical activity (7), but the age, diet and smoking appeared as a factor influencing Hb A1c independently. (1,2,3,5,6,7,8)

VI. CONCLUSION

By reviewing all the previous studies, blood levels of Hb A1c demonstrated values of 3.6% as minimum and 6.5% as maximum value. (2,7,10,12)

REFERENCES


AUTHORS

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Typical Pulmonary Carcinoid Tumor Case Presented With Ectopic Cushing Syndrome

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Abstract- Bronchopulmonary carcinoid tumors are observed rarely. Patients’ usual symptoms are coughing, hemoptysis and recurrent pneumonia, nevertheless in rare cases these tumors may be diagnosed with clinic conditions related paraneoplastically secreted hormone effects. In this case report, we aimed to indicate a typical lung carcinoid tumor causing ectopic cushing syndrome, presented with diabetes mellitus, hypertension and hypokalemia.

Index Terms- Carcinoid tumors, cushing syndrome, hypokalemia

I. CASE REPORT

A 59-year-old female who had complaints of mouth dryness, polydipsia, fatigue, facial rashes and common body pain over the last month. She had been diagnosed with hypertension for 8 years ago and had her menopause 10 years ago. On the physical examination, arterial blood pressure was found as: 140/90 mmHg, pulse: 88/min, and malar rash-like cutaneous eruptions on the face, central obesity, eyelid edema, bilaterally pretibial pitting edema was observed at inspection. The lung sounds were bilaterally coarse in auscultation, there were rales in the apical region of the right lung. In the laboratory (Table 1), it was found that fasting blood glucose level, hypokalemia, leukocytosis, high ACTH, and cortisol levels then diabetes mellitus treatment was ordered and potassium was replaced due to hypokalemia. Cortisol suppression was not observed in the dynamic tests for Cushing’s syndrome (1 mg dexamethasone, 2 days, 2 mg dexamethasone, 8 mg dexamethasone). Patient was considered as ectopic cushing syndrome according to clinical and laboratory trials. A lolluted and irregular centred lesion in 22*14 mm dimensions was observed in paracardiac fatty tissue that localized adjacent to medial segment of right lung middle lobe in postero-anterior graphy and thorax computer tomography. PET/CT was performed to show that primary tumor and metastasis. Increased FDG (fluoro-deoxy-glucose) uptake in the nodule (1 cm) (SUV max: 3.2) located in the apex of the right lung and in the nodule (1.5 cm) (SUV max: 2.6) located in the anterior face of upper lobe right lung in PET/CT were evaluated as malignant lesion. FDG Uptake in the nodule (2x1.5 cm) (SUV max: 1.5) located in medial face of right lung middle lobe was evaluated as benign lesion. Increased FDG uptake in both of adrenal gland was assessed as adrenal hyperplasia. A neuroendocrine tumor was detected in true-cut biopsy performed on a nodul found in the medial part of the right lung middle lobe, therefore three nodular lesions located in posterolateral and apical parts of right lung upper lobe and medial part of middle lobe were excised with wedge resection. Histopathologically (Fig. 3), atelecstasis findings, anthracosis, chronic inflammation, pneumonia found in nodular area located in posterolateral part of right lung upper lobe, pneumonia in the apical segment of the right lung upper lobe, nodular area in the medial part of the right lung middle lobe, were determined as grade 1, well differentiated neuro-endocrine carcinoma. Oral anti-hypertensives and anti-diabetes of the patient, were stopped, because post-operative blood glucose levels were normalized and hypertension was not seen on measurements. In the follow-up, ACTH and cortisol levels were observed as normal and patient was discharged after 1 mg dexamethasone suppression test was also found as normal. Oncology polyclinic control was recommended.

II. CONCLUSION

Cushing Syndrome is a condition that can cause serious morbidity and mortality when it’s not treated properly because of cortisol release. Generally, there are two groups of cushing syndrome; ACTH dependent and ACTH independent. ACTH-dependent is 80% of CS which caused by corticotropic pituitary adenomas, but more rarely due to ectopic ACTH release. I Lung Cancer has a high incidence and mortality rate all over the world cancer type (2). Neuroendocrine tumors (NET) are evolved from gastroenteric, hepatopancreatico bilier, urogenital, bronchopulmonary system epithelium which include enterochromaffin or Kulchitsky cells. These cells are commonly found in the gastrointestinal tract (GIS) (except the esophagus), urogenital tract and bronchial epithelium. Bronchialcarcinoid tumors are considered to originate from neuroendocrine cells which are belonging to the APUD (amine precursoruptakeand decarboxylation) system in the bronchial mucosa. (3) The incidence of neuroendocrine tumors is 0.2/100.000 and NETs constitute is 0.5% of all cancers (4). Carcinoid tumors are the most common neuroendocrine tumors however they are less common than other lung tumors (5). The bronchial carcinoids were first described by Müller in 1882. It was first used by Obemderfer in 1907 as "carcinoid" (6) Most commonly seen in the age of 50-60. The male / female ratio is 0.9 / 1 (7). Bronchopulmonary neuroendocrine tumors are basically evaluated in four subtypes according to the 2004 World Health Organization (WHO) histological classification. These 4 subtypes are: low-grade typical carcinoid tumors (TK), intermediate-grade atypical carcinoid tumors (AK), and 2 high graded mild large-cell neuroendocrine carcinomas (BHNEK) and small cell lung cancer (SCLC). TK and AK together are evaluated as bronchopulmonary carcinoid (BP-carcinoid) tumors (8). More than
half of typic bronchopulmonary carcinoid tumors are peripheral and constitute %10 of bronchopulmonary carcinoids. On the other hand, 80% of typical carcinoid tumors are located on central and 20% are peripheral (3, 9, 10). In our case, typical carcinoid tumor had peripheral settlement . 58% of BP-carcinoids are symptomatic at baseline, often patients present with coughing at 32%, hemoptysis at 26%, 24% atypical pneumonia (classic triad) due to luminal obstruction and tumor ulceration. Symptoms vary on hormonally active tumors depending on the effect of the bioactive hormone whichsecreted years ago without findings of luminal obstruction. Peripheral tumors may remain asymptomatic for a long time in consequence of their small size and very slow growth (10-12). In our case, there were no classical symptoms which are seen in common because of peripheral settlement. Non specific symptoms such as lassitude was in the foreground. Bronchopulmonary carcinoid tumor is found in patients who present with ectopic cushing syndrome at range of over %40. (13). In our case ectopiccushing syndrome is confirmed by dynamic tests which performed because of the high serum cortisol at 8:00 am baseline and baseline ACTH. Radiologically, more than %40 of pulmonary neuroendocrine tumors may detected on x-ray graphies. Bi scans with contrast is gold standart on radiologic imaging (15). 75% of BP-carcinoid tumors can be detected by bronchoscopy and diagnosed by biopsy (3, 10). In our case, lesion was perific lesion and diagnosised with true-cut biopsys in the presence of imaging. In p-carcinoid tumors, the main treatment is the perfect resection of tumor with protecting paranchymal tissue. Wedge resection or segmentectomy is performed in small tumors with peripheral settlement, mass extirpation or bronchial resection are performedin central tumors (10,16,17). In our case, mass was removed with wedge resection because tumor was small and peripheral settling. Somastatin is the first suggested option who has carcinoid syndrome and acromegaly as medical treatment after surgery. Taking serum cortisol levels under control is recommended after surgery and if it’s resistant to treatment bilateral surrenectomy is an option (18). Radiofrequency ablation after primary surgery is often recommended in pulmonary carcinoids with slow progress ion. Cytotoxic therapies are only standard in aggressive metastatic pulmonary carcinoid tumors, although their effect is limited (18). Our case was presented with symptoms of ectopic cushing syndrome. Serum cortisol levels were found under control in dynamic tests after primary surgery. It was seen that diabetes mellitus and hypertension, which is caused by ectopic cushing syndrome clinically, is found that completely resolved after surgery. In conclusion, although bronchopulmonary carcinoid tumors are rare, they can be present with the clinical appearance of paraneoplastic secretory hormones, and especially in typical carcinoid tumors can be completely cured after surgery.

REFERENCES


AUTHORS

First Author – Bilkay Serez, Trakya University Medical Faculty, Department of Pulmonology, Edrine, Turkey
Table 1: The pre-operative and post-operative laboratory values of patient

<table>
<thead>
<tr>
<th>Laboratory Value</th>
<th>Pre-Operative</th>
<th>Post-Operative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leukocyte (4000-10000 uL)</td>
<td>20000</td>
<td>10980</td>
</tr>
<tr>
<td>Hemoglobin (11-15 gr/dl)</td>
<td>13.2</td>
<td>12.5</td>
</tr>
<tr>
<td>Trombosit (150000-450000 uL)</td>
<td>257000</td>
<td>207000</td>
</tr>
<tr>
<td>Glucose (70-105 MG/DL)</td>
<td>154</td>
<td>97</td>
</tr>
<tr>
<td>HbA1c (%3.6-5.8)</td>
<td>6.5</td>
<td></td>
</tr>
<tr>
<td>Sodium (136-145 mmol/L)</td>
<td>147</td>
<td>136</td>
</tr>
<tr>
<td>Potassium (3.5-5.1 mmol/L)</td>
<td>2.9</td>
<td>4.5</td>
</tr>
<tr>
<td>Creatinine (0.57-1.11 mg/dl)</td>
<td>0.61</td>
<td>0.6</td>
</tr>
<tr>
<td>AST (0-34 U/L)</td>
<td>11</td>
<td>19</td>
</tr>
<tr>
<td>ALT (0-55 U/L)</td>
<td>31</td>
<td>22</td>
</tr>
<tr>
<td>Sedimentation (0-20 =MM/SAAT)</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>ACTH (0-46 pg/ml)</td>
<td>1250</td>
<td>12.8</td>
</tr>
<tr>
<td>08.00 Cortisol (4.3-22.4) ug/ml</td>
<td>75</td>
<td>20.96</td>
</tr>
<tr>
<td>Mid-night 23.00 Cortisol</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>1 mg dexamethasone Supression Test (&lt;1,8 ug/ml)</td>
<td>75</td>
<td>0.97</td>
</tr>
<tr>
<td>2 days 2 mg dexamethasone supression test (&lt;1,8 ug/ml)</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>8 mg dexamethasone test</td>
<td>75</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1: a) PA Lung Graphy BT, b) Thorax CT with Contrast
Figure 2: F-18 FDG PET/CT
Real-time Supervision through ICT in Construction Quality Management and Monitoring System in Bangladesh

Ziaul Muhammad Hussain¹, Dr. Syed Akhter Hossain²

¹ Bangladesh University of Professionals
² Daffodil International University

Abstract- Although an innovative approach Construction Quality Management and Monitoring Systems / frameworks (CQMMS) in the development industry are regularly actualized to guarantee that adequate exertion is made by organizations to accomplish the required levels of value for customers. Achievement of these quality levels can bring about more prominent consumer loyalty, which is principal to guarantee long haul intensity for development organizations. In any case, the development division is as yet lingering behind different businesses as far as its effective reception of ICT based CQMMS, because of the relative absence of acknowledgment of the advantages of these frameworks among industry partners. Therefore there is a basic need for thorough investigation of selection of CQMMS in the development part. This paper thoroughly examines in the development part setting, the effects of all the notable variables encompassing effective usage of CQMMS in building associations, particularly those of outer elements.

This investigation is a piece of a progressing PhD venture, which intends to build up another structure that incorporates both inner and outside variables influencing CQMMS execution. To accomplish the paper point and goals, meetings will be led to characterize the outer variables impacting the selection of CQMMS, and to acquire all encompassing basic achievement factors or key success factors (KSFs) for executing these frameworks. In the following phase of information accumulation, a poll study will be produced to explore the prime boundaries confronting the reception of CQMMS, the KSFs for their execution, and the outer components influencing the reception of these frameworks. Following the overview, contextual investigations will be attempted to approve and clarify in more prominent detail the genuine impacts of these components on CQMMS selection.

In particular, this paper assesses the impacts of the outside variables in terms of their effect on execution accomplishment inside the chosen contextual investigations. Utilizing discoveries drawn from breaking down the information acquired from these different methodologies, particular suggestions for the fruitful execution of CQMMS will be exhibited, and an operational structure will be created. At long last, through a core interest gathering, the discoveries of the examination and the new created system will be approved. At last, this structure will be made accessible to the development business to encourage the more noteworthy selection and usage of CQMMS. What's more, organization of the material proposals recommended by the examination will be imparted to the development industry to all

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Index Terms- Real-time, Monitoring, ICT, Construction, Supervision, Quality.

I. INTRODUCTION

The introduction of an Information and Communication Technology (ICT) based Construction Quality Management and Monitoring System (CQMMS) in the development business will ensure the nature of the development work, give opportune supervision and evaluate the advance of the venture work with straightforwardness, effectiveness and responsibility. This activity of ICT base CQMMSs considered as advancement in Bangladesh. Bangladesh is a little nation in the south-east Asia, as far as land estimate it is 98th nation however regarding populace it is 8 biggest nations on the planet. Likewise positions among the best few as far as running number of benefactor subsidized foundation ventures. Over 3.5 million workers make this industry as the 3rd largest in Bangladesh.

II. METHODOLOGY

The general examination will utilize a blended strategies approach, (both quantitative and subjective information gathering and investigation), to encourage the achievement of the expressed paper targets. This approach incorporates the utilization of a quantitative overview, subjective top to bottom meetings and contextual analyses to gather the required information. At long last, a concentration gathering will be used to guarantee the legitimacy of the system that is at last created from this paper. These different information accumulation stages and approaches are portrayed underneath.

A. In-Depth Interview

Meetings will at first be utilized to gather the required information identified with outer components and KSFs for CQMMS selection in the development business. The choice of the meeting philosophy is influenced by the idea of the destinations and the examination questions. Along these lines, this examination will utilize semi-organized, up close and personal, top to bottom meetings to acquire particular and
centered information of the exploration marvels. The meeting calendar will incorporate open-ended inquiries to furnish respondents with the flexibility to talk about and express their points of view and empower the scientist to acquire criticism from interviewees. The inquiries will be planned to characterize the outside elements influencing effective appropriation of CQMMS in the development division. Next, inquiries will be developed to recognize extensive rundown of KSFs for CQMMS execution, since KSFs distinguished from the writing audit won't be sufficiently comprehensive to be explored later, utilizing the poll study.

The assessed time of each meeting is around 60 minutes, which ought to give people satisfactory time to express their conclusions about particular issues. All respondents will be made a request to give their consent to record the meetings, with the scientist at the same time recording their answers by note-taking, which may be utilized later if any issues happen in recorded meetings. The meetings will be attempted with a similar populace which will be later utilized as the objective pilot test for the poll overview. Besides, the outcomes got from breaking down the information of meetings will be utilized to plan a poll overview.

B. Poll Survey

An overview will be utilized to evaluate the elements influencing the successful usage of CQMMS in the development business. Utilizing this strategy will encourage noting the initial three inquiries of the paper; RQ1, RQ2, RQ3. The essential explanation behind using this philosophy is to help the analyst to research hindrances to the powerful usage of CQMMS in the development section by achieving an extensive variety of members inside Bangladesh development organizations.

The overview philosophy will likewise be utilized to investigate the KSFs for actualizing CQMMS adequately in the development business. At long last, the survey will likewise help to explore the outer components affecting the reception of CQMMS inside the section. The survey will be developed to gather information development organizations; the poll populace will include all levels to accumulate a more all-encompassing learning with respect to CQMMS execution in various sizes and levels of multifaceted nature of associations.

The determination of organizations to take an interest in the fundamental poll will be embraced on the premise of their official number of workers. The foreseen test focused to take part in this examination contains roughly 250 Bangladesh development contractual workers, with a few members inside each organization being relied upon to take part in the poll review. These members will be illustrative of various administrative levels, for example, venture chief, development director, quality supervisor and site administrator, to acquire an exhaustive outline of variables influencing CQMMS execution.

C. Personal and friends Demographics

This section is created to gather individual and foundation data about members, for example, age, level of capabilities, years of experience, position inside their organization, and part inside their organization. This section will likewise include a few inquiries with respect to the principle elements of the partaking organization, including the measure of the firm, organization income, organization section, and kind of works led.

D. Barrier to CQMMS Implementation

This section comprises of things investigating the real obstructions blocking effective usage of CQMMS in the development business. The things in this section will be founded on the hindrances already distinguished in the writing survey. The reactions to questions are chosen from a five-point Likert scale. As indicated by this, the most well-known scale for getting sentiments from respondents by deciding their assertion or conflict with an announcement. The respondents will be solicited to show their levels from understanding or difference in regards to the deterrents to fruitful execution of CQMMS by choosing one of five articulations, running from unequivocally consents to emphatically oppose this idea.

E. KSFs for CQMMS Implementation

This section incorporates the overview questions identified with exploring the KSFs for the effective reception of CQMMS. The things will be founded on the KSFs recognized from the writing audit, and the KSFs coming about because of breaking down the information from interviews led preceding the poll review. A five-point Likert scale will likewise be utilized to build the inquiries in this section.

F. External Factors Affecting CQMMS Implementation

The last section of the poll overview is intended to investigate the outside elements influencing effective selection of CQMMS in the development business. The motivation behind this section is to stress the effect of ecological elements characterized already amid the meetings. In the wake of posting and gathering outer components distinguished by the meetings, the inquiries of this section will likewise be built utilizing a five-point Likert scale. The normal results of the review will distinguish, the deterrents hindering the powerful execution of CQMMS in the development business, the KSFs for fruitful usage of CQMMS and, at long last, the ecological elements impacting compelling work of CQMMS in the development division.

III. ARGUMENTS

ICT and its auspicious, successful and proficient Communication organizing do offer the best of the two worlds in terms of powerful and opportune correspondence network among significant partners and utilization of Hi Tech in ICT, and besides, features of bury correspondence systems and intra firm interchanges are upgraded to best, ideal degree. Notwithstanding, in the Bangladeshi Construction Business, CQMMS is surely testing and hazard loaded since, on a very basic level, there is absence of strong innovation requirement, howdy tech preparing and organization of best in class is reliant on outer experts, and restrictive expenses of ICT do go about as significant snag in minimal effort Bangladeshi Construction business [2].

This paper needs to offer fitting Case Study investigation of some of real Bangladeshi Construction organizations which have accomplished outcomes because of ICT innovation authorization.
and furthermore dive into fizzled ventures which needed required ICT bolster and due ingenuity [3]. Despite the fact that administration is altogether endeavoring to limit bungle and set up straightforwardness.

It is basic for a Mega Construction Projects spanning over different scattered geographic areas to be furnished with advanced observing and supervision framework for development quality administration framework (CQMMS) that use present day ICT. The coveted ICT based CQMMS devices will be comprises of an android based versatile application, concentrated database server, web application and a revealing stage that helps to screen and administer development works guaranteeing most elevated quality (development) is achieved in the remote, topographically scattered areas of Bangladesh where assets are rare and physical access is trying because of poor street availability.

![Figure: 1, ICT based CQMMS - observing and development quality administration framework](image)

Construction Quality Management and Monitoring System (CQMMS)

To encourage the coveted quality and venture objectives, site or field level data is gathered through an android portable application called ICT Monitoring Tool. The base components of the apparatus have been gotten from redoing an open source arrangement, Open Data Kit. This portable application fills in as contribution to the ICT Monitoring frameworks were confirmation and information legitimacy are guaranteed through login and secret key. Likewise information submitted through the versatile application gives client data, telephone number, International Mobile Equipment Identification (IMEI) number [], date - time and GPS codes. The following figure portrays the framework engineering of the ICT Monitoring for Construction Quality Management and Monitoring System.

This portable application enables confirmed clients to submit review structures to report the advance of the development works [4]. These structures are created particularly for huge scale development venture with frequent discussion with the undertaking partner/engineers from financing organization, execution office, counseling, checking/assessment and contracting organizations. Here is a rundown factor that altogether impacted the plan of the Survey/Supervision frames.

A. Development Specifications and the offering reports
Field understanding of the designers from different controls of the framework – (Owner, Consultants and Contractors)

- Knowledge of the cell phone innovation – (wifi, gps, 2/3/4 G systems, touch screens)
- Experience of the PDA use among the clients
- Network scope and web association speed in the remote undertaking destinations;
- Feedback of the pilot clients;
- English perusing and composing abilities of the clients;

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• Limit elucidating writing inputs

The client of the framework can be any individual who is included and affected by the development beginning from the proprietor/benefactor, usage organizations, specialists, contractual workers and affected group. However, essential supporters of the framework are proprietor, advisor, and contractual workers [5]. With a specific end goal to encourage the smooth operation of the framework, the clients are separated in the accompanying classifications as site level clients, area/local level clients, and headquarter level clients. The accompanying table separates the clients with parts for the ICT Monitoring and Construction Management System.

<table>
<thead>
<tr>
<th>ID</th>
<th>User Designations</th>
<th>Roles</th>
<th>Submission Frequency</th>
<th>Role Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Site Supervisor / Field Supervisor</td>
<td>FLU</td>
<td>Daily/Weekly</td>
<td>Responsible for close supervision, checking and revealing information from destinations on the day by day exercises. Directions exercises for Lab Technician cum estimator and Field Resident Engineers. Assesses and reports quality confirmation works - Lab Test exercises, test comes about, guarantee quality and amount of the development materials.</td>
</tr>
<tr>
<td>3</td>
<td>Field Resident Engineer</td>
<td>DLU</td>
<td>Fortnightly</td>
<td>Provided direction, supervision and preparing for the field level staffs. Directions exercises with contractual workers and execution organizations. Gives joint estimations temporary worker and usage offices.</td>
</tr>
<tr>
<td>4</td>
<td>Regional Resident Engineer</td>
<td>RLU</td>
<td>Monthly</td>
<td>Performs authoritative exercises for the district, helps field inhabitant engineers. Guarantee quality developments by giving preparing and incessant site visits.</td>
</tr>
<tr>
<td>5</td>
<td>Headquarter Engineer</td>
<td>HLU</td>
<td>Quarterly</td>
<td>Provides shop illustrations joining configuration changes, conducts preparing for the field level staffs and field inhabitant engineers. Audits the work presented by the site manager, lab specialists and estimators and field engineers.</td>
</tr>
<tr>
<td>6</td>
<td>Social/Environmental Assessment</td>
<td>HLU</td>
<td>Quarterly</td>
<td>Provides preparing and supervision for the field level staffs. Guarantees the social and ecological issues are tended to and alleviated by the characterized structure and moderation design, change the arrangement - look for endorsement if necessary.</td>
</tr>
<tr>
<td>7</td>
<td>Deputy Team Lead - Headquarter</td>
<td>HLU</td>
<td>Quarterly</td>
<td>Assists Team Leader with his everyday exercises, issues directions to the locales. Directions meeting with the temporary workers merchants. Approves and support the bills put together by the contractual workers. Behaviors starting execution survey for the staffs of the headquarter and district. Behaviors occasional site visits.</td>
</tr>
<tr>
<td>8</td>
<td>Team Lead - Headquarter</td>
<td>HLU</td>
<td>Quarterly</td>
<td>Provides administration as the Engineer for the task, rent with outer elements (contributors, temporary workers, sellers and other outsiders), sets up best practice, and rouses colleagues. Behaviors site visits to guarantee most elevated nature of development accomplished</td>
</tr>
</tbody>
</table>

B. Accompanying practical Classification

To outline the parts of the clients, these structures are separated into the accompanying practical classifications, for example,
1. Budgetary/Physical Progress;
2. Operational;
3. Quality Assurance/Quality Control;
4. Social and Environmental Assessment

C. Accompanying consecutive work stages

Further to the previously mentioned useful classes, these review frames are separated into the accompanying consecutive work stages to precisely mirror the work quality and advance, following figure demonstrates the previously mentioned shapes – functionalities, frequencies and the reason for the structures created for the Large Scale Construction Project.
The field level information is sustained to the brought together database to run the web application where the specialists from headquarter evaluate the information (webpage data, work data, remarks, photographs, GPS and date-time-stamp), give criticism to the territorial/website level assets to enhance quality, guarantee wellbeing, address website issues/abnormalities and perceive the benevolent acts [6]. The remarks and input from the architects; area and locale are put away in the database server by means of web application. This web application functions as a stage that gives work check component where a bit of development work is put together by website supervisor, through pertinent work review shapes.

### D. Quality Management in Construction

Working under the banner “Quality and Safety First”, the CQMMS places top priority to Quality Management throughout all its stages, processes and outputs, with the aim of offering a set of best quality construction structures to the beneficiaries. The system will also ensure successful project completion within the agreed time and cost, and increased stakeholder satisfaction. CQMMS identifies and governs four main processes in its Quality Management practice. The first of these is Quality Planning, followed by Quality Assurance, Quality Control and Quality Acceptance. Quality Management is one component of the overall Project Management Process of MDSP, which has the following Stages:

<table>
<thead>
<tr>
<th>Form ID</th>
<th>Form Name(s)</th>
<th>Functional</th>
<th>Frequency</th>
<th>Purpose of the Form(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F001</td>
<td>Handover Certificate</td>
<td>Operational</td>
<td>Once or Twice</td>
<td>Anyone can hand over the site to the contractor</td>
</tr>
<tr>
<td>F002</td>
<td>Initial Works</td>
<td>Operational</td>
<td>Until the site is ready for Piling</td>
<td>To report the ongoing site preparation works</td>
</tr>
<tr>
<td>F003</td>
<td>Piling Works</td>
<td>Quality</td>
<td>Until Piling is complete</td>
<td>During the progress of the piling work</td>
</tr>
<tr>
<td>F004</td>
<td>Pile Load and Integrity Test</td>
<td>Quality</td>
<td>Until the testing is complete</td>
<td>Report Pile Load and Integrity Tests</td>
</tr>
<tr>
<td>F005</td>
<td>Concrete Works</td>
<td>Quality</td>
<td>Until Concreting Works</td>
<td>Report Concrete Works for Sub / Super Structure</td>
</tr>
<tr>
<td>F006</td>
<td>Brick and Block Works</td>
<td>Quality</td>
<td>During Brick and Block Works</td>
<td>Report Brick and Block Works by Floors</td>
</tr>
<tr>
<td>F007</td>
<td>Electrical and Solar Works</td>
<td>Quality</td>
<td>During Electrical &amp; Solar Works</td>
<td>Report Electrical and Solar Works</td>
</tr>
<tr>
<td>F008</td>
<td>Plumbing and Sanitary Works</td>
<td>Quality</td>
<td>During Plumbing &amp; Sanitary Works</td>
<td>Report Plumbing and Sanitary Works</td>
</tr>
<tr>
<td>F009</td>
<td>Finishing Works</td>
<td>Quality</td>
<td>During Finishing Works</td>
<td>Report Tiling, Painting, Doors-windows, Tubs, walls, Landscaping and etc Works</td>
</tr>
<tr>
<td>F010</td>
<td>Roads, Culvert and Paving Works</td>
<td>Quality</td>
<td>Roads, Culvert and Paving Works</td>
<td>Report Roads, Culvert and Paving Works</td>
</tr>
<tr>
<td>F011</td>
<td>Furniture Works</td>
<td>Quality</td>
<td>Furniture Works</td>
<td>Report Furniture Works</td>
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<tr>
<td>F013</td>
<td>Compilation Certificate</td>
<td>Operational</td>
<td>Once or Twice</td>
<td>When the Site is ready for takeover over from the Contractor</td>
</tr>
<tr>
<td>F014</td>
<td>Financial Progress</td>
<td>Financial</td>
<td>Monthly as needed</td>
<td>Report the amount billed by the contractor</td>
</tr>
<tr>
<td>F015</td>
<td>Lab Tests</td>
<td>Quality</td>
<td>As Needed</td>
<td>Report All the tests performed for the project</td>
</tr>
<tr>
<td>F016</td>
<td>Visit Report</td>
<td>Operational</td>
<td>As new materials are delivered</td>
<td>Inspect Visit Report and Resources Inventory</td>
</tr>
<tr>
<td>F017</td>
<td>Physical Progress</td>
<td>Financial</td>
<td>Monthly as needed</td>
<td>PBG / UGS sends the report with the Physical Progress at the end of the month</td>
</tr>
<tr>
<td>F018</td>
<td>Social Survey</td>
<td>Social</td>
<td>As Needed</td>
<td>Report Focus Group Discussions for Social issues</td>
</tr>
<tr>
<td>F019</td>
<td>Environmental Survey</td>
<td>Environmental</td>
<td>As Needed</td>
<td>Report Field Group Discussions for Environmental issues</td>
</tr>
<tr>
<td>F020</td>
<td>Sub Soil Investigation</td>
<td>Social</td>
<td>As Needed</td>
<td>Report Sub Soil Investigation Works</td>
</tr>
</tbody>
</table>
The above 5 stages are used to interpret the progress of any individual sub project, any single package or else the overall MDSP as a whole, and the four components of Quality Management in MDSP mainly fall into different stages of the Project Management Process as follows: According to PMBOK Guide following mapping

<table>
<thead>
<tr>
<th>The Management</th>
<th>Quality</th>
<th>Relevant Stage of Project Management Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Quality Planning</td>
<td>Investigating/Planning</td>
<td></td>
</tr>
<tr>
<td>2. Quality Assurance</td>
<td>Executing</td>
<td></td>
</tr>
<tr>
<td>3. Quality Control</td>
<td>Monitoring and Controlling</td>
<td></td>
</tr>
</tbody>
</table>

4. Quality Acceptance | Closing

The diagrammatic representation in the following page demonstrate the relationship between the Quality Management components (several other functions closely related to them) and the general Project Management Process Stages as prescribed by PMI. While many activities function within each stage of the Project Management Process, only some of those directly related to the Quality function are shown under each Stage in the diagram.
The submitted frames are in a split second looked into and commented by field and provincial architects. On the off chance that the concurred development quality is met the entries are checked and remarked by headquarter engineers are recorded and put something aside for future evaluating [7]. This multitier check steps guarantees straightforwardness and responsibility among the key partner and specialist’s dynamic investment to guarantee the quality development. The previously mentioned process is delineated in the figure underneath.
Figure 6; Collaboration among the cross functional team flowchart introduced in CQMMS

Later the information from the database server is shown in the detailing stage to infer the different predefined reports that cause us to track the task execution.

- Site Visit Summary Report – by Project and Personnel
- Package Progress Report - by Physical and Financial
- Quality Control Report – Number of tests directed and dissentions
- Work Improvements – by locales and work stages

Keeping in mind the end goal to figure the physical advance of the development for a site, following table is created. This table information is started from singular Bill of Quantities (BoQ). Additionally, each pertinent ICT frame relate to the mapped rate advance. In this way, we can rapidly decide the collected advance of a task in light of the structures submitted for the venture. Normal development of the building is generally stay indistinguishable where just shifting parts are profundity of heaping length, earth work to level the building up to ground level (EGL) [8].

Figure: 7, Breakdown of the progress based on completed work phases / tasks

<table>
<thead>
<tr>
<th>#</th>
<th>Major Work Items for the construction</th>
<th>Corresponding CQMMS Forms</th>
<th>Work %</th>
<th>Accumulated %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Site facilities, including labor shed, Site Office etc</td>
<td>Initial Works</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>2</td>
<td>Layout &amp; Setting Out</td>
<td>Initial Works</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>3</td>
<td>Piling - Pile boring - casting</td>
<td>Piling Works and Concrete Works</td>
<td>22%</td>
<td>24%</td>
</tr>
<tr>
<td>4</td>
<td>Pile Integrity Test</td>
<td>Pile Load and Integrity Test</td>
<td>1%</td>
<td>25%</td>
</tr>
<tr>
<td>5</td>
<td>Pile Load Test</td>
<td>Pile Load and Integrity Test</td>
<td>0%</td>
<td>25%</td>
</tr>
<tr>
<td>6</td>
<td>Pile Cap - Excavation and Concrete works</td>
<td>Piling Works and Concrete Works</td>
<td>4%</td>
<td>29%</td>
</tr>
<tr>
<td>7</td>
<td>Grading Beams, Bracing Beam &amp; Short Column</td>
<td>Concrete Works</td>
<td>3%</td>
<td>33%</td>
</tr>
<tr>
<td>8</td>
<td>Ramp, Slab Mat, Drop wall and others</td>
<td>Concrete Works</td>
<td>8%</td>
<td>40%</td>
</tr>
<tr>
<td>9</td>
<td>Ground floor roof Slab</td>
<td>Concrete Works</td>
<td>5%</td>
<td>45%</td>
</tr>
<tr>
<td>10</td>
<td>Pedestrian &amp; Ground floor column</td>
<td>Concrete Works</td>
<td>3%</td>
<td>48%</td>
</tr>
<tr>
<td>11</td>
<td>Ground Stairs</td>
<td>Concrete Works</td>
<td>3%</td>
<td>51%</td>
</tr>
<tr>
<td>12</td>
<td>All Top floor column</td>
<td>Concrete Works</td>
<td>2%</td>
<td>53%</td>
</tr>
<tr>
<td>13</td>
<td>All Top floor Roof Beams</td>
<td>Concrete Works</td>
<td>3%</td>
<td>54%</td>
</tr>
<tr>
<td>14</td>
<td>Top roof slab</td>
<td>Concrete Works</td>
<td>7%</td>
<td>61%</td>
</tr>
<tr>
<td>15</td>
<td>Top stair</td>
<td>Concrete Works</td>
<td>1%</td>
<td>62%</td>
</tr>
<tr>
<td>16</td>
<td>Top drop wall parapet sunshade</td>
<td>Concrete Works</td>
<td>5%</td>
<td>67%</td>
</tr>
<tr>
<td>17</td>
<td>Ground Floor Brickwork</td>
<td>Brick and Plaster Works</td>
<td>1%</td>
<td>68%</td>
</tr>
<tr>
<td>18</td>
<td>Jat &amp; 2nd Floor Brickwork</td>
<td>Brick and Plaster Works</td>
<td>3%</td>
<td>71%</td>
</tr>
<tr>
<td>19</td>
<td>Plumbing and Sanitary Works</td>
<td>Plumbing and Sanitary Works</td>
<td>6%</td>
<td>77%</td>
</tr>
<tr>
<td>20</td>
<td>Electrical and Solar Works</td>
<td>Electrical and Solar Works</td>
<td>7%</td>
<td>82%</td>
</tr>
<tr>
<td>21</td>
<td>Collapsable Gates, Doors, Windows, Glass, Grills and Stair Railings</td>
<td>Finishing Works</td>
<td>4%</td>
<td>86%</td>
</tr>
<tr>
<td>22</td>
<td>Jat and 2nd floor Plastering Completed</td>
<td>Brick and Plaster Works</td>
<td>3%</td>
<td>89%</td>
</tr>
<tr>
<td>23</td>
<td>Tiles - All floors Completed</td>
<td>Finishing Works</td>
<td>2%</td>
<td>91%</td>
</tr>
<tr>
<td>24</td>
<td>Paints - Interior and Exterior Completed</td>
<td>Finishing Works</td>
<td>1%</td>
<td>92%</td>
</tr>
<tr>
<td>25</td>
<td>Furniture Completed</td>
<td>Furniture Works</td>
<td>2%</td>
<td>94%</td>
</tr>
<tr>
<td>26</td>
<td>Tube well Work Completed</td>
<td>Finishing Works</td>
<td>4%</td>
<td>98%</td>
</tr>
<tr>
<td>27</td>
<td>Social and Environmental Facilities</td>
<td>Social Survey, Environmental Survey</td>
<td>2%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Information submitted through the ICT Monitoring App keeps up unmistakable phases of the works. Here are the stages – Issued, Work Improvement Needed (WIN), Resolved and Verified, Closed or No Action Needed. It would be ideal if you see beneath pictorial portrayal of the stages.
Starting from Issued when the Site Supervisor rounds out the overview shapes catching the photos, recordings, GPS arranges and fitting data [9]. Work Improvement Needed (WIN): Work change see is issued when the locale, territorial or headquarter colleagues audits the work study put together by the site chief from the field and recognizes that the work quality should be enhanced or extra data is required. Site level colleagues will audit the WIN recognized by District, Regional or Headquarter level clients and take after the directions and play out the enhancements or errands. Refresh the status to Resolved and Verified. Surveys the notes, related pictures and investigations the accommodation by the site manager, once fulfilled they can close the ticket or sends back to the field level staff to enhance the work promote for the second round. The will sit tight for the site/field level staffs to make fitting changes until the point when they are happy with the work quality. Once the work quality is accomplished, remarked and guaranteed by anybody from area, locale or headquarter it is respected that the work is occurrence is finished. This alternative is acquainted with track the portion of the non-noteworthy things as these could critical to keep it in the radar.
In the framework while presenting the structures utilizing ICT Monitoring Mobile Application, geographic spatial information is consequently caught for 5 m or less; more often than not the frameworks acknowledges the perusing if the precision is around 50 m. That implies the site manager or the field specialist ought to be with the 50 m range of the site while rounding out the study frames. Once spared the GPS arranges in a finished and spared review form, the Longitude and Latitude values are not editable [10].

The portable checking application of the CQMMS in view of ICT doesn't require online availability to work the versatile application, for the most part to gain information with GPS facilitates, pictures apropos information. Point to take note of the GPS framework does not require web or versatile availability to catch the GPS code. However the AGPS chipset (Assisted GPS) empowered telephones couple with the cell phone network catches GPS code quickly as it speed up the catch procedure [1]. Therefore one can finish the study at a remote area where web association is not accessible. Once the frame is spared with GPS code, information and photograph prove are gathered in the versatile application is sent to the brought together database through web association (for the most part 3G and 2G information bundles).

**E. Use of Mobile Phone Technology:**

Literature review conducted for the thesis work indicate that there are various systems already in place in the developed countries such as building information management systems (BIM), not only these systems are extremely expensive, difficult to learn and requires dedicated connectivity and power to run the hardware machines such as computers, monitors, routers and networks. [12].

In this study introduced a Mobile phone application that is secure. The mobile phone does not require dedicated power at the site to operate. With the vision 2020 goal, Bangladesh has over 99% mobile phone and internet coverage through 2/3 G network. Total number of subscriber count for the mobile internet usage have increased to 63 million plus by February 2017, according to the recent update by Bangladesh. [14]. Telecommunication Review Commission (BTRC). This has become a tipping point to develop the system with mobile phone technology.

**F. GPS Technology**

Since the introduction of the mobile smart phones from early nineties the technology has evolved many folds, [13] with the blessing of globalization many local brands are manufacturing smart mobile phones and price of these smart mobile phones have significantly dropped. Technology has miniature everything in this device starting from mobile phones, power of a computer - word processing, calculator, e-mail, internet browsing, global positioning systems (GPS), accelerometer, gyroscope, radar, various sensors, finger print and retina scanner.

**G. Touch Screen and Power Independence**

The touch screen interface has made the smart mobile phone very easy to operate. Hence launching of an mobile application to use / operate an important task like construction quality management and monitoring become seamless to the modern user-base. [13]

These smart mobile phones are as powerful as a personal computer and do not need live electricity connection to operate. And all the tasks that have been performed with PC can be performed with this device without the overhead pc being bulky, occupies valuable space, ect.


There are three main parties involved in general construction works; usually owner desires a building structure to be constructed, consulting firms with architects and engineers are appointed to design the building structure to the desired specification of the customer and then contractors are awarded to complete the work to deliver the vision of the owner or the customer ensuring the quality of the work. Usually for a large scale project there could be other players involved such as Donors, Implementation Agencies, Monitoring and
Evaluation Teams and Sub-contractors. Below is the hierarchical structure how a construction project work is executed, ultimately engineer of the consultant responsible for the successful completion of the construction work.

1. Headquarter Engineers;
2. Regional Engineers;
3. Site Supervisors;

Team members at the site level reports to regional Engineers. And engineers at region reports to the engineers at headquarter and ultimately all engineers in headquarter report the team leader of the project or the project manager of the consultant side. Team Leader delegates some of his tasks / signing authority to the engineers in the regions and fields.

Individual team members from each of the teams (consultants, contractors and owner/implementation agencies) have been consulted to design the features of Construction Quality Management and Monitoring System. Based on their inputs supervision tasks / activities are broken down for the buildings or any construction works in the following sequential manner.

1. Site Development Works
2. Sub-Structure Works
3. Super Structure Works

In order to ensure quality, detail checklists are created for each phases of the construction work with close consultation of the Engineers from Consultant, Contractor and Implementation firms. Detail of the check list of the above mentioned work phases are provided in the appendix section.

I. Integrated Workflow

These checklists are in the brain of the Construction Quality Management and Monitoring System, mobile application. Site engineers are given smart phones with the CQMMS mobile application installed. Site Supervisor / Engineers will visit construction sites and report the quality of the work performed with photo evidence, through the CQMMS, mobile app by selecting the appropriate work stage. A notification will be sent to the corresponding hierarchy (field resident engineer) to assess the work and further comment on the quality of the reported work based on the submission. If the FRE is NOT satisfied with the work; an work improvement notice (WIN) will be issued and site supervisor should followup the WIN work until FRE is satisfied with the work. Otherwise the submitted work is noted as approved and verified. A small number of work submissions are reviewed by headquarter engineers to ensure proper quality management process are adhered by site supervisor and field resident engineers.

J. Application Security / Authentication and Fraud proofing mechanism

The CQMMS has to be fraud proof and secure. Latest web security technology is introduced in the CQMMS to make it impenetrable to hackers and crackers alike. The data collected from the field are secure and tamper proof. SQL injection, Cross site scripting, website redirection are prevented through structure coding and utilization of the Model View Controller (MVC) framework.

Two factor authentication mechanism is introduced in the CQMMS, mobile application - to ensure authenticity of the submissions by the field supervisor and field resident engineers. A pin code is generated after successful logins. This approach of layered security is widely practiced to ensure highest level of security in the commercial business applications. [16]

K. Innovative work flow mechanism

Further to aforementioned security features while submitting data through the survey forms team members are required to take selfies showing the work-site in the background, fill-out appropriate check list for the completed works items with photo evidence and GPS location code.[15] This process ensures that the team members have visited work site, performed the tasks according to specified requirements (as per check list), schedule and date - times of the submission matches with the data - meta data of the photo evidence submitted. This is process significantly enhances accuracy and quality of the work as site level team members are bound to report irregularity [11].
L. Education, Training and Further Career Advancement

This CQMMS is working as a vehicle to improve the quality of the construction personnel in Bangladesh. The survey form checklists in the CQMMS mobile app is the results of the many years of field and construction experience of the project team members - consultants, contractors and owners accumulated. Through the checklist the field supervisors are guided to execute work like a pro with many years of experience. In the eyes of the contractor and subcontractor this junior engineers are regarded very highly because of the intelligence of the CQMMS tool. This recognition works as a motivating factor for the site supervisor to pursue higher education in the field of constriction.

Regular use of the CQMMS to submit work enhances the ability of the team members to read and write in English. The practice of English prepares the workforce to elevate their standard to international level.

CQMMS provides the due transparency to the headquarter / management to appreciate work performed by the field level team members.

The CQMMS helps to identify and address any substandard work performed by the contractor. Therefore it works as a voice of the engineers to as not only field engineer but regional and headquarter engineers stand by the field engineer to improve the quality of the work performed by the contractor.

M. Effective and Optimized Utilization of Resources

This tool allows will engineers to be assigned effectively and efficiently based on the work schedule hence reducing the cost of the construction operation.

This CQMMS tool is essentially extends the eyes and ears of the team leader and project director, headquarter engineer that enhances the quality of the construction quality of the work.

Thorough the implementation of the CQMMS tools - project work is executed in the systematic manner. This tool allows effective allocation of the resources based on the nature of the work.

Although this tool only concentrate on the items quality of the construction work which accounts for almost 22% for overall project success but almost 50% for the internal influencing factors that are with in the control of the project implementation team.

This tool helps headquarter to closely monitor the supervision work conducted by the team members responsible for regular site visits.

Availability, quality and quantity of the construction materials, machinery and manpower (resources) are at the site during the applicable construction work phases.
### Set Project Stage for BHP06

<table>
<thead>
<tr>
<th>Task Options</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Handover</td>
<td></td>
</tr>
<tr>
<td>Pile Load &amp; Integrity Test</td>
<td></td>
</tr>
<tr>
<td>Super-Structure - Ground Floor Beams &amp; Roof Slab</td>
<td></td>
</tr>
<tr>
<td>Super-Structure - Second Floor Short Column &amp; Staircase</td>
<td></td>
</tr>
<tr>
<td>Super-Structure - Ground Floor Slab on grade</td>
<td></td>
</tr>
<tr>
<td>Planting Works</td>
<td></td>
</tr>
<tr>
<td>Electrical Fittings</td>
<td></td>
</tr>
<tr>
<td>Social Impact Assessment</td>
<td></td>
</tr>
<tr>
<td>Visitors Log</td>
<td></td>
</tr>
<tr>
<td>Paving/Protection Works</td>
<td></td>
</tr>
<tr>
<td>Tubewell</td>
<td></td>
</tr>
<tr>
<td>Initial Work</td>
<td></td>
</tr>
<tr>
<td>Sub-Structure - Pilecap, Grade Beam &amp; Short Column</td>
<td></td>
</tr>
<tr>
<td>Super-Structure - First Floor Short Column &amp; Staircase</td>
<td></td>
</tr>
<tr>
<td>Super-Structure - Second Floor Roof, Beams, Slab, Water Tank</td>
<td></td>
</tr>
<tr>
<td>Brick Works</td>
<td></td>
</tr>
<tr>
<td>Plumbing Works - Piping</td>
<td></td>
</tr>
<tr>
<td>Tiles &amp; Panton Stones Works</td>
<td></td>
</tr>
<tr>
<td>Plumbing Fittings</td>
<td></td>
</tr>
<tr>
<td>Environmental Impact Assessment</td>
<td></td>
</tr>
<tr>
<td>Resource - manpower, materials &amp; machines</td>
<td></td>
</tr>
<tr>
<td>Culvert &amp; Bridge Works</td>
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</tr>
<tr>
<td>Site Completion Certificate</td>
<td></td>
</tr>
<tr>
<td>Sub-Structure - Piling</td>
<td></td>
</tr>
<tr>
<td>Super-Structure - Column, Staircase &amp; Ramp</td>
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</tr>
<tr>
<td>Super-Structure - First Floor Roof, Beams and Slab</td>
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</tr>
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<td>Super-Structure - Other Concrete Works</td>
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<tr>
<td>Electrical Works - Cabling</td>
<td></td>
</tr>
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<td>Doors, Rails, Windows, MS Gala, Collapsible Gate, &amp; Railings</td>
<td></td>
</tr>
<tr>
<td>Painting Works, Interior &amp; Exterior</td>
<td></td>
</tr>
<tr>
<td>Solar Panel Works</td>
<td></td>
</tr>
<tr>
<td>Quality Control - Lab Test</td>
<td></td>
</tr>
<tr>
<td>Landscape Works</td>
<td></td>
</tr>
<tr>
<td>Road Works</td>
<td></td>
</tr>
<tr>
<td>Furniture Works</td>
<td></td>
</tr>
<tr>
<td>Defect Log</td>
<td></td>
</tr>
</tbody>
</table>

### Manage Project Stages

Home / Operations / Manage Project Stages

### Set Project Access for Zia Hussain, ICT Monitoring Rep - Headquarter, D&O

<table>
<thead>
<tr>
<th>Access Codes</th>
<th>Access Codes</th>
</tr>
</thead>
<tbody>
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<td>NOAP54</td>
</tr>
<tr>
<td>NOAP376</td>
<td>NOAP576</td>
</tr>
<tr>
<td>NOAP146</td>
<td>NOAP396</td>
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<tr>
<td>NOAP223</td>
<td>NOAP204</td>
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<td>NOAP175</td>
<td>NOAP122</td>
</tr>
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<td>LAX337</td>
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<tr>
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<td>LAX339</td>
</tr>
<tr>
<td>LAX224</td>
<td>LAX234</td>
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<td>LAX255</td>
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</tr>
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<td>LAX163</td>
<td>LAX156</td>
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<td>LAX144</td>
</tr>
<tr>
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<td>LAX383</td>
</tr>
<tr>
<td>LAX134</td>
<td>LAX134</td>
</tr>
</tbody>
</table>

[www.ijsrp.org](http://www.ijsrp.org)
Complicated work component measurements can be reported, measured and verified through tri-party (contractor, consultant and owner) submission with photo evidence and tests results, hence making the bill approval mechanism a breeze at the headquarter.

N. Lesson learns

Computerization process is introduced utilizing triggers and put away techniques to abridge the information from Open data kit tables to the Web Applications tables in the database. Different reports are produced in light of the outlined and changed information. Difficulties of Software Development with any open source instruments are comparative and Open data kit is no special case to that. Likewise improvement of construction supervision and quality administration framework in light of an open source instrument is testing. Here are few lesson learnt.

• System created a great deal of unstructured and excess information set aside critical opportunity to correspond the information so keep the overview shape straightforward. Strict information approval could dissuade the beginner clients from receiving the framework
• Any change in the structures and work process requires huge adjust.
• Version contrariness with the incessant arrival of android telephone forms requires retrofitting work.
• Database structure in the open source arrangement is not effective outline in this way database size will develop exponentially so design the information development estimation deliberately.
• Get a reasonable information authentic/maintenance assertion – build up a system to occasionally information cleansing/recorded instrument.
• Open data kit has irritating screen invigorates and outline inside edges that can be agonizing with work when you have loads of information.

• Dedicated arrangement, support and upkeep of Open data kit required consistent supervision with qualified assets.

IV. CONCLUSION AND RECOMMENDATIONS

In spite of being essentially a developing and creating economy in Asia, the development business in Bangladesh is well set and exceptionally development centered because of a few reasons, essential among which are: Abundant and shabby work, great infra structure, solid, development situated administration and its help for development organizations and furthermore great inflows of FDI in the Construction Industry in Bangladesh. Be that as it may, the principle issues besotting Bangladesh is not innovation, as such, but rather its use, sending and authorization, particularly utilization of high innovation for cutting edge, convenient, quality and enforceable CQMMS inside ICT, with the end goal that private business people, open private supplier organization firms and joint government extends in provincial Bangladesh are viably overseen, for better and snappier outcomes [1].

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Future Prospects of the Wind Energy in Libya

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Abstract- Libya is one of the oil producing countries, Oil is the main supplier of the country's economy. Libya has wind energy resources. Is available in many areas in Libya in reasonable quantities sufficient to solve the crisis that Libya is going through the power cuts for long hours. This paper examines wind energy, the most important renewable energy resource in Libya.

The objective of the paper evaluates the wind energy in the capital city of Tripoli, Libya. The data of the Climate Data Station was collected at the Solar Research Center in the capital Tripoli during at a height of 65.14 meters and 32.48 latitudes.

Index Terms- Tripoli, Libya, Wind, Energy

I. INTRODUCTION
That the use of wind in Libya as a source of renewable energy is among the alternative sources of oil that maintain the Libyan prosperity prospects because it is clean energy, and many countries interested in developing this source, and aims to achieve this.

It is estimated that Libya has important and important sources of renewable energies such as wind and solar energy, enough to solve the crisis that Libya suffers from power outages, but exploitation is very small. Electricity is one of the most useful things provided by wind power, because it helped to save a large amount of the expenses and costs paid by the Libyan state in exchange for generators.

Wind power characteristics can be used more than once, do not contain any environmental contaminants, land can be used as agricultural fields, it is possible to use small mills (generators) placed in the top buildings. The paper presents the assessment of wind power in the Libyan capital, Tripoli, which is considered the largest city in Libya and located in western Libya.

II. METHODOLOGY AND RESULTS
We used different methods of research, including fieldwork, telephone calls and interviews with people with wind energy experience in Tripoli City to collect evidence and information on wind potential in Libya's largest cities. I have interviewed several experts, managers, engineers and academics working in the energy sectors Solar energy, meteorology and wind power, including the Solar Energy Research Center in Tripoli, Libya, which has been able to create a schedule assessing the wind energy of the Libyan capital Tripoli with their assistance.

III. WIND ENERGY IN LIBYA
Traditional energy sources in Libya are limited to two sources: oil and natural gas. Studies have confirmed that oil resources will not last for more than 50 years of production while natural gas is expected to continue for a longer period in Libya. The city council said the first wind farm in Libya would soon be established in the city of Msallata.

Libya's first wind power farm is to be set up in Msallata city very soon, the municipal council has announced. Components of 16 wind tribunes arrived in the city last week, and the installation process has already started. The power farm will be set up in Shaafeen Park with a capacity of 27 MW that represents 70% of the city's needs for electricity. The project, supervised by the Renewable Energy Body of the Electricity Company, comes amid the severe electricity crisis in the country. Msallata is a city 130 km to the east of Tripoli.[1].

IV. ASSESSMENT OF WIND ENERGY OF IN THE CITY OF TRIPOLI LIBYA.
The preliminary studies and measurements conducted by the research team in this paper showed that Libya enjoys a clear richness from the wind power source in several regions in general. We have collected wind energy data in the city of Tripoli Libya. The results showed that the city has high wind speeds that can be exploited in the results were encouraging, indicating that this region is considered one of the best regions in Libya for the production of electricity using wind energy.

The research team collected the data produced by the readings of the Climate Data Station at the Solar Energy Research and Research Center in the capital Tripoli during 2011-2016 at a height of 65.14 meters and 32.48 latitudes [2] as shown in Table (1)
V. CONCLUSION

The next Libyan government should have a clear vision of harmonizing economic and social development and protecting the environment. It is in this context that the Libyan state will be required to achieve this goal, to encourage scientific studies and research in the field of alternative energy and to attract scientists to Libya to work in this wonderful field.

It is useful here for the next Libyan government to encourage bold investment owners to use wind energy as an alternative to oil which soon will run out. It is important to bring the latest technology to Libya to wind energy, and to attract companies specializing in wind energy. Also, the Libyan government is required to educate the Libyan citizens on how to use wind energy and circulate it. The first step that the Libyan government should take is to change the limited view of the Libyan people for this energy. New Libya to keep up with the times It has to go towards the use of wind energy and solar energy because the orientation is strategic as the researchers at the World Energy Organization that the electricity produced by oil and gas will become old the next five watts are the highest cost of electricity generated by solar and wind power..

Table(1): Monthly average of wind speed (m/s) during 2011–2016

<table>
<thead>
<tr>
<th>years</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
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<td>2.9</td>
<td>3.9</td>
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<td>3.4</td>
<td>3.5</td>
<td>3.2</td>
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<td>3</td>
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<td>2.9</td>
<td>3.2</td>
<td>38.2</td>
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<tr>
<td>2012</td>
<td>3.4</td>
<td>3.6</td>
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<td>3.7</td>
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<td>37.6</td>
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<td>38.2</td>
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<tr>
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ACKNOWLEDGMENTS

In this paper, the researchers would like to thank the Solar Energy Research Center in Tripoli, Libya, for helping us obtain wind energy readings in recent years and to provide work at a remarkable level despite Libya’s crisis in recent years. The authors would like to present this research to everyone who encouraged them to write the research, especially the spirit of Abdul Hakim Al-Ghanoudi.

REFERENCES

[2] The climatic data station at the Solar Research and Research Center in the capital of Tripoli during the period 2011-2016 at a height of 65.14 meters and 32.48 latitudes.

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Teaching methods used by teachers to facilitate hygiene Practices in Early Childhood Education Centers in Londiani Sub-County

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Abstract- Effective hygiene education for children is not just teaching facts about health risks and bad hygiene practices. The purpose of the study was to examine the teaching methods used by teachers to facilitate hygiene Practices in Early Childhood Education centers in Londiani Sub-County. The study used active learning instructional theory. This theory states that effective implementation of the curriculum depends on personal hygiene, good health, primary health care, educational environment and food hygiene. The study adopted the descriptive survey research design to investigate hygiene practices. The study was conducted in Londiani Sub-County, Kericho County. The target population of eighty (80) early childhood educational centres and twenty four (24) was sampled for the study. Random sampling technique was used to select the participants. The target population consisted of 24 head teachers and 48 ECD teachers. Research instruments comprised Questionnaire, Interview and Observation schedules. Data analysis was done with the aid of Statistical Package for Social Sciences. The output was presented by use of frequency tables, bar graphs and pie charts. The findings showed that the centres in the area used several methods to teaching hygiene practices which included role playing, use of puppets and using the older pupils to teach the younger pupils hygiene practices. Most of the ECDE centres reported that they used demonstration to teach hygiene practices. There is need therefore to integrate demonstration with other methods to make it permanent and easier for the children.

Index Terms- Teaching methods, hygiene practices, implementation, Sanitation

I. INTRODUCTION

According to Dania (2010), personal hygiene should be observed throughout life for healthy living. Recognizing hygiene habits for prevention of disease is important for children. In a child-to-child program, child can be an excellent health messenger and health volunteer in their own community. School children can learn easily to cultivate good habits and to mold themselves. Experts’ advice that health education should be a part in school curriculum. All health issues irrespective of their sensitivity can be inculcated in educational programs in methodological and scientific way. It has got preventive, promotive and rehabilitative dimensions. The school children can be an excellent mode to transmit information. Here the researcher hope that they can be messengers of proper hygiene practices to other children, to their parents, to the family and finally to reach out the community.

In developing countries, young children spend much of their lives in the care of their brothers or sisters. Experts observed the need for teaching these older children to provide better care for their siblings. The importance of child-to-child programme is thus stressed. The child to child programme was first launched in 1978, by the Institute of Child Health, London. The main focus of child-to-child programme is activity oriented method of teaching, where emphasis is placed on the development of participatory approach of learning and teaching. In child-to-child programme the health educator may be a primary school teacher or a health worker.

II. LITERATURE REVIEW

Life skills-based hygiene education

Effective hygiene education for children is not just teaching facts about health risks and bad hygiene practices. The life skills approach focuses on changing children’s hygiene behavior and the hygiene behavior of their families and wider community with a view to improving their quality of life (UNICEF, 2012). It continues to indicate that to ensure that all aspects of appropriate hygiene behaviors are addressed, hygiene education focuses on the development of:
a. Knowledge and understanding of practical and theoretical information on hygiene. For example, all children know that illnesses like diarrhoea and worm infections result from poor hygiene practices such as not washing hands with soap after visiting a toilet.

b. Attitudes and personal opinions about hygiene that influence actions and responses to unhygienic situations. For example, children want to be clean and healthy. Older children feel responsible and confident to help others, particularly younger children, practice good hygiene.

c. Practical skills to carry out specific hygiene behaviors. For example, children wash hands to prevent illness and infection. They avoid contamination with solid waste and help bury or burn it.

UNICEF (2012) in its WASH programmes for school specify that teaching hygiene behavior is most successful when it focuses on a limited number of behaviors with the biggest overall health impact. Changing a single behavior can make an enormous difference. An example of promoting hygiene behavior that stresses a particular action and its effects is the sanitation and hygiene-related The F-diagram shows the path by which germs can spread from person to person.

According to Postma et. al (2004) on life skills based hygiene education, teaching and learning methods in life skills-based education are mainly interactive and participatory. They give learners the opportunity to explore and acquire hygiene promoting knowledge, attitudes and values. They also allow them to practice the skills they need to avoid risky and unhealthy situations and adopt and sustain healthier life styles. In addition, the skills that are developed may be applicable in situations that go beyond practices specifically related to the prevention of hygiene, water and sanitation related diseases. Teaching and learning methods for any particular lesson are determined by the learning objectives and the desired behavioral outcomes. They continue to note that knowledge of academic facts, such as the causes of diseases and the names of bacteria and viruses, is important to fulfill the standards that may be set in the school curriculum. However, these facts are more valuable to students when they are taught in ways that make them relevant to their real lives; when they are accompanied by opportunities to practice skills that allow the students to apply their knowledge; and when they are related to attitudes and values that allow them to make sense of these inputs for their everyday lives. Example of ways of teaching young children is like the exercise below;

**Use of group work for participatory methods**

Participatory learning and teaching methods such as games, role-plays group discussions, can be carried out with the whole group or with several small groups. Working with a whole class is best when dealing with a method in which students give each other positive feedback. Working in small groups is recommended when every student has to participate more than once or if the method takes longer. Use of small groups gives every student a chance of fully participating and encourages participation and exchange of opinions. At the same time, the group work helps the children to develop cooperation and teamwork skills. At the end of small-group work at least a few minutes should be dedicated to work with the whole class. The spokesperson of each group then responds back to the class about what the group was doing and what conclusions and results they reached (Postma, et. al 2004). To make sure working in small groups is successful, there are a few basic rules that the teacher should establish with the students:

1. All the children in the group work together. Cooperation is important, not competition.
2. Each member of the group helps the other children to feel that they belong to the group.
3. All participants in the group are equal and have the same rights. This can be stressed by sitting in a circle.
4. A group is doing well when all the children are involved in the activities and no child dominates, although different children will “participate” in different ways.
5. To help the groups do well, the teacher can observe the process of each group and provide encouragement/positive reinforcement noting where each of them is doing well. She can also ask a student in each group to observe who are most active and least active and report afterwards. This is not to criticize or punish the children or group concerned, but a way to learn and improve!
6. It is important to nurture trust in the group.

For effective child-centred life skills-based hygiene education, the methods that are used must be activity-based and joyful for children. They should not only give the children the opportunity to learn by doing and experiencing but also the chance to learn at their own pace and following their own learning style. Use of these methods will give the children the chance to experience, discover, create and construct their own knowledge. This will give them the opportunity to personalize the information and develop positive attitudes and values as well as to practice the skills they need to avoid risky behaviors and unhealthy situations and adopt and sustain healthy life styles (Postma, et. al 2004).

**Class conversation**

Snell (2000) asserts that questions from pupils can induce a class conversation. The whole class discusses the subject. Learners can interact. As interaction proceeds, the children can be asked to summarize the discussion, giving the thread of the conversation. During the evaluation, the whole discussion is summarized. Subsequently, the teacher gives remarks about the discussion and the input of the students in order to evaluate the conversation. Through class conversations, all children are able to learn to formulate and defend their opinion and learn to respect the opinions of others. In the context of life skills-based hygiene education, this method can, for example,
be used to discuss whether or not hygiene work is only for women and girls, or whether having or not having latrines is a family’s individual responsibility.

Younger children can sit in a circle and be asked to talk about a subject in turn, e.g. about how they wash: if they had a bath or a wash this morning or some other time, if the water was cold or hot, if they used soap/a cloth/brush/sponge/certain leaves or a local ‘sponge’ such as a dried plant, who washed them, etc. The other children may react as well, but the teacher will make sure that every child gets a turn and that no child is criticized or stigmatized by the other children.

**Concentric circles**

For this activity the teacher forms two equal groups. One group stands in a circle facing out and another group stands in a circle facing in, so that everyone is facing anpartner. The class is asked a question. The students in the inner and outer circle discuss this question in pairs. After a few minutes the outer circle rotates to the left, or that each student is facing someone new. The process is then repeated, whether the same question or a new one. The types of questions that are asked will vary with the age of the group and the purpose of the activity. Younger children can, for example, ask each other, “Do you like to wash your hands, or your face, or take a bath?” “Why?” “Why not?” Older children may discuss, for example, “Is hand washing after using the latrine important?” (Postman et. al 2002). “Why/why not?” or “Are home latrines only affordable for ‘rich’ people?” “Is it useful to purify water? And can everyone do it?” Through the use of this method the children are stimulated to exchange ideas and experiences in pairs. In plenary the teacher may then ask the children what kind of answers came out, give information and facilitate discussions on how to solve any specific problems that came up.

**Problem-solving discussions**

The subject of the discussion has to be determined and delineated by the teacher. The class decides which students are in the discussion. The other students will be observers. The learners tell why they want to talk about this subject and determine the goals of the discussion. The discussion starts and the students in the discussion group can express their viewpoint. Observers note the differences/agreements between the viewpoints. Next, the students try to formulate the problem. Then they may brainstorm about possible solutions. Thereafter, arrangements are made for solving the problem, for instance: who will do what and when? Finally all the pupils evaluate the discussion. Questions that can be added during this evaluation are: “Was the discussion useful for all the students?” “Has the goal of the discussion been achieved?” “Did everyone participate?”, etc. This method is especially suitable for children in the age group of 10-12 years. It is suitable for all kinds of topics on which children can take action, e.g. how to wash hands well when one has no soap, or how to assist the older and poorer people in the community in getting a latrine (Ahmad & Alibhai, 2001).

**Forum discussion**

This activity is for the older age group. The subject of the forum discussion is defined and expressed as a question. The class chooses three forum members. As preparation, the forum members get rules and information that they have to study in advance. The teacher introduces the subject and gives an explanation if necessary. Each forum member is given some time to express his/her viewpoint on the subject. After this, the forum members publicly discuss the subject with each other. The ‘listeners’ can ask for information, place remarks or ask questions to which the forum members have to respond (Burgers, 2000). They continue to note that through a forum discussion the children will be able to develop listening skills, as well as skills to react critically and ask questions. They will also learn that although sometimes opinions differ, this does not mean that one opinion is more right than another (Hart, 1997). Some of the topics that may be useful to discuss are, for example, which safe water sources exist in the community and how to keep them clean, how to prevent local diseases from spreading, how to involve community in hygiene issues.

**Continuum or rope-voting**

For this activity the teacher draws a line on the ground. One end of the line represents strong agreement with a particular position or statement and the other end represents strong disagreement. Gradations of opinion are represented by points between. The teacher reads out a statement on a controversial issue. An example is: “We cannot improve hygiene because we are too poor.” Or: “Taking care of domestic hygiene is for women and girls only.” The teacher then asks the students to take up a position along the line that represents their point of view. The teacher then breaks the line into two segments with an equal number of students. The two extremes of the line are matched with a more moderate position. The children are asked to share their points of view with each other. They may then choose to regroup along the line. By asking children to agree or disagree with a certain statement and make them explain to the other group why they agree or disagree, the children will learn to make decisions as well as to explain themselves in plenary (Burgers, 2000).

**Brainstorming**

This method stimulates creative thinking. It also generates a number of alternatives. A variation of brainstorming is that each child writes his/her idea on a slate, card or piece of paper. These are put on the ground, read aloud, and then grouped. Alternatively, each child may write his/her idea on the blackboard and then the entries are read out and grouped. Examples for
Role-play
This method exercises the students’ ability to take other perspectives into account and develop problem solving and conflict resolution skills. Children are asked to act a given situation. As they role-play the situation, they communicate with each other and develop new skills such as cooperation, creativity and self-expression. Some children feel shy acting in front of a large group, so ask for volunteers or form groups which will all role-play in a small group. Once the role-play or plays have been done, the teacher may ask questions about the performance. It is very important that the roles played do not extend beyond the subject, as this discourages children from participating in role-play (Ahmad & Alibhai, 2001). During hygiene classes the children might be asked to act out the activities involved in the preparation of food or a water point committee meeting in which the roles and responsibilities of the different community members are discussed. During the evaluation of each role-play, it is important that the teacher pays attention to how the gender roles and responsibilities are acted out, and whether these could be changed. In some cases it might also be important to pay attention to other aspects of social equity, such as cooperation between different economic, religious and/or ethnic groups (Winblad & Dudley, 1997).

Pantomime
The children perform a play without talking. They may, for example, be asked to depict a certain subject, such as playing with and taking care of their siblings. After the pantomime, the observers explain what was depicted and this is followed by a discussion with the whole class (Postma et al, 2004). By playing pantomime, the creativity and concentration of children is expanded and they also learn another form of expression. The observers learn to interpret body language and a different form of expression from talking.

Songs
With the children in the age group of 4-7 years, the teacher can teach a song to the children, which they sing once a week. At this age, the children like repetition and the song can serve to reinforce good hygiene behaviors. Combining the song with behaviors give the children the opportunity to move. They may, for example, sing about and imitate all the hygiene practices that they may do before they go to school, when they collect water, when they eat certain types of food, etc. With children of the age group of 9-12, the teacher can provide the class with a subject for the song and ask the children to make the song. The class chooses a melody of a song which is known by them all. The teacher divides the class into four or more groups. Each group makes a couplet on the melody of the chosen song, after which each group sings their couplet to the other groups. Finally all the couplets merge to create a song. Subjects that can be used for making a song might be the risks of playing in an unhygienic community, or a song about the different diseases in the community that are related to water, sanitation and hygiene and how these can be prevented. Older students can also make songs for children in the lower classes (Snell, 2000).

Games
The use of games such as board and card games can have an entertainment value and can arouse children’s interest. If properly used, games can promote children’s participation and bring a meaningful context to the teaching and learning process. Examples of games that can be adapted for the context of life skills-based hygiene education are ‘snakes and ladders’, ‘memory’ 5 and ‘happy families’ (ten sets of quartets each depicting, for example, four different safe water sources, or four different latrines, four tools needed to clean latrines, four different uses of water, etc.) (Mitchell & Savil-Smith, 2004).

Demonstrations
This method requires the students to practice skills such as preparing food in an hygienic way, washing hands or washing dishes. Demonstrators can be silent, with the comments and explanations coming from the observers. Alternatively, demonstrators themselves may be asked to explain, for example, how they wash the dishes, when and why they wash the dishes and how they dry the dishes. They can also discuss such issues as what to do when there are no materials to wash and dry the dishes, or when such materials are too expensive and how to ensure that the dishes are stored in such a way that they are kept clean. More sensitive issues, such as what to do if fathers or boys do not help with the household chores, may also be discussed via demonstrations (Postma et al, 2002).

III. RESEARCH METHODOLOGY

This study adopted descriptive survey to investigate the implementation of hygiene practices in early childhood education. The researcher chose descriptive survey research design because it enabled the researcher to collect data from wide population using questionnaires. It also allowed the researcher to use a sample from the population and generalized to the entire population with respect to the problem under study.

The study was carried out in Londiani Sub-County, Kericho County, Kenya. The area was found to be ideal for the study because of scarcity of water in the region which is the main commodity in the implementation of hygiene practices (Chumo, 2016).
In Londiani Sub-County, there are 80 ECDE centers both in public and private schools. The target population consisted of 80 head teachers and 160 ECD teachers from Londiani sub-county. These participants were used to generalize the results of the entire Sub-County. The study used simple random sampling to select the sample size for the head teachers and teachers. To ensure equal representation and fairness, the researcher sampled the schools based on private and public categories. Two tins were labeled ‘private’ and ‘public’ schools respectively. She then wrote the names of the schools based on the target population of the school categories. For private, 15 school names were written in small papers and folded then dropped in the labeled tin. After shaking, 30% of the population was picked. This made a sample size of 4 headteachers and 9 ECDE teachers for the private schools. The same procedure was followed to get the sample size for the public schools headteachers and ECDE teachers respectively. This was based on Mugenda & Mugenda (2003) which indicated that a sample size of 10% - 30% of the target population is sufficient to form a study.

The sample size achieved was 4 headteachers and 9 ECDE teachers for private category and 20 headteachers and 39 ECDE teachers for public schools. The researcher used purposive sampling to sample the 24 schools used for observation. The researcher used questionnaires, interview and observation checklist to collect the data. Descriptive statistics was used to summarize quantitative data. Analysis involved sorting the questionnaire, tabulating and coding the responses. Qualitative analysis was used for open ended questions from questionnaires that require respondents to give their own opinions. Qualitative data processed by categorizing and discussing the responses for each item according to the set objectives.

IV. RESULTS

Table 1: Teachers Responses on Methods of Teaching Hygiene Practices

<table>
<thead>
<tr>
<th>Respondents</th>
<th>Yes F</th>
<th>(%)</th>
<th>No F</th>
<th>(%)</th>
<th>Total F</th>
<th>%</th>
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<tbody>
<tr>
<td>Learners carry out indoor and outdoor activities</td>
<td>47</td>
<td>97</td>
<td>1</td>
<td>3</td>
<td>48</td>
<td>100</td>
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<tr>
<td>Use of model to demonstrate hand washing</td>
<td>35</td>
<td>74</td>
<td>13</td>
<td>26</td>
<td>48</td>
<td>100</td>
</tr>
<tr>
<td>Dramatize eating habits</td>
<td>37</td>
<td>76</td>
<td>11</td>
<td>24</td>
<td>48</td>
<td>100</td>
</tr>
<tr>
<td>Use puppets in teaching hygiene practices</td>
<td>35</td>
<td>74</td>
<td>13</td>
<td>26</td>
<td>48</td>
<td>100</td>
</tr>
<tr>
<td>Children role play brushing teeth</td>
<td>44</td>
<td>91</td>
<td>4</td>
<td>9</td>
<td>48</td>
<td>100</td>
</tr>
<tr>
<td>Older children teach younger children use of latrines</td>
<td>45</td>
<td>94</td>
<td>3</td>
<td>6</td>
<td>48</td>
<td>100</td>
</tr>
<tr>
<td>Use of songs to teach hygiene practices</td>
<td>45</td>
<td>94</td>
<td>3</td>
<td>6</td>
<td>48</td>
<td>100</td>
</tr>
</tbody>
</table>

The findings show that 47 (97%) of the 48 teachers agreed that learners carried out indoor and outdoor activities, 35 (74%) said they used model to demonstrate handwashing while 37 (76%) teachers said they dramatized eating habits.

Thirty five teachers (74%) used puppets to teach compared to 13 (26%) who disagreed. Use of puppetry in hand washing is an interesting way of learning. As explained by Sturz (2009), puppetry addresses the multiple intelligences by tapping into the different ways in which students learn. On use of role play, 44 (91%) teachers agreed while 4 (9%) teachers said they don’t use. Forty five (94%) of teachers stated that older children were encouraged to teach the younger children of the use of latrines while the same number 45 (94%) said they used songs to teach hygiene practices. The headteachers were asked to give the methods they use in the teaching of hygiene practices in their respective schools. This was a confirmation to the teachers’ responses. The data is summarized in the table below;

Table 2 Head teachers Responses on Methods of Teaching Hygiene Practices

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation</td>
<td>2</td>
</tr>
<tr>
<td>Demonstration and explanation</td>
<td>4</td>
</tr>
<tr>
<td>Demonstration only</td>
<td>10</td>
</tr>
<tr>
<td>Clubs and peers</td>
<td>3</td>
</tr>
<tr>
<td>Explanation only</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>24</strong></td>
</tr>
</tbody>
</table>

The findings show that different methods were used in the different schools visited. Two (8.33%) of the headteachers said they used observation while 4 (16.67%) headteachers used both demonstration and explanation.
Children learn through observation and imitation of modeled behavior and listening to instructions from parents or caregivers (Bandura, 2002). Ten (41.67%) used demonstration only, 3 (12.5%) use clubs and peers to teacher while 5 (20.83%) used explanation only. The findings imply that teachers in Londiani use demonstration and explanations mainly to teach ECDE children hygiene practices. This is in line with Meltzoff (1999) who noted that imitation is not only an initial toe-hold in self-other mapping, but also provides a means for elaborating it. The same cognitive machinery that enables children to imitate what they see hence is helping them involve various senses to make learning permanent. The findings also concur with Health Promotion Board (HPB) (2012) who noted that children tend to look up to parents and caregivers as their role models and follow by example.

V. CONCLUSION AND RECOMMENDATIONS

The findings showed that the centres in the area used several methods to teaching hygiene practices which included role playing, use of puppets and using the older pupils to teach the younger pupils hygiene practices. 97% of the ECDE centres in Londiani sub-county carried out indoor and outdoor activities which enhanced the teaching of hygiene practices. Most of the schools also used modeling to teach their learners hand washing habits while other centres modeled and 74% used puppets. The use of puppetry in hand washing is an interesting way of learning. The observation made by the researcher showed quite a number of learners did not wash their hands after visiting the toilet. This could be caused by lack of facilities which would otherwise enhance the practice.

The results from the head teachers’ questionnaires indicated that 41.47% of the schools used demonstration only to teach hygiene practices while others used observation, demonstration and explanation, clubs and peers or explanations only. Based on the findings, the method used to teach hygiene practices was demonstration only. Most of the ECDE centres reported that they used demonstration to teach hygiene practices. There is need therefore to integrate demonstration with other methods to make it permanent and easier for the children.

There is need to introduce and integrate other methods of teaching hygiene practices like songs, concentric circles, pantomime, games and role play. This will make the children learn and understand hygiene practices faster and better.

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REFERENCES


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Patterns and preferences of communication tools among clinicians in a psychiatric setting: A cross sectional survey

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**Abstract**

**Background:** Communication platforms such as messaging services and social media (SM) have been embraced by healthcare professionals for various purposes. The patterns, purpose of use and, preferences for various tools needs to be explored.

**Objectives:** To explore the patterns and purpose of use for various communication tools and social media to identify the most preferred communication tool in a psychiatric setting.

**Design/setting:** An anonymous survey was set up on SPSS dimensions and emailed to all clinicians in Institute of Mental Health from Dec 2017 to Feb 2017.

**Measurements:** Descriptive statistics were employed to analyse demographics, utilisation patters, and preferences for SM and messaging services on three groups of clinicians based on seniority: Non Specialists, (NS), Early Career Psychiatrists (EP), and Senior Career Psychiatrists (SP).

**Key Results:** The overall response rate was 27%, constituting of Non Specialists (52.8%), Early Career Psychiatrists (24.5%), and Senior Career Psychiatrists (22.6%). 94.3% of clinicians utilised Whatsapp for personal communications. While 60.7% of NSs embraced Whatsapp for official communications, EPs and SPs preferred other mediums. Outside emergencies, SP were generally cynical about utilising messaging services for patient care. All groups agreed that identifiable patient information should not be shared through messages (69.8%). Facebook, Youtube, and Instagram were the most popular SM amongst clinicians. 34% of clinicians checked their emails twice a day, and 52.8% felt overwhelmed by the volume of emails they received daily.

**Conclusion:** There appears to be clear awareness regarding the ethical boundaries of communication tools with most clinicians still preferring to receive information through concise emails. A disparity in outlook is observed between junior clinicians who embraced technology better than the senior clinicians who were more cautious.

**Index Terms** - Communication, Doctor-patient relationships, Medical education-computer/web-based learning, Patient safety, Survey Research

I. **INTRODUCTION**

Communication tools have fuelled healthcare reformation by improving patient care (Hersh, 2002). Emails are prime modes of communication amongst organisations and healthcare professionals despite lacking an evidence base for its effectiveness (Atherton, Sawmynaden, Sheikh, Majeed, & Car, 2012). Although concerned about the implications of use, clinicians embrace this technology for communicating with patients (Gaster et al., 2003) and colleagues (M. H. Mobasheri et al., 2015). A Finnish study evaluating physician attitudes to official email communications reported general satisfaction despite concerns that critical information can be lost due to the length and volume of emails received daily (Karhula, Kauppila, Elonheimo, & Brommels, 2011). The communication landscapes within organisations took a rapid turn after the advent of social media (SM).

SM has enhanced social interactions, professional relationships through dissemination of key information. Clinicians, patients, and caregivers leverage the technology to extend medical support and thus improve health outcome (Desai, Ndukwu, & Mitchell, 2015; McGowan et al., 2012). SM is an ideal platform for clinicians to interact with peers, expand professional knowledge, and receive up-to-date information regarding clinical practices or research (Househ, 2013; Ventola, 2014). A longitudinal study in western Europe has shown a 57% increase in Facebook usage between 2009 to 2011 among healthcare professionals (Van de Belt, Berben, Samsom, Engelen, & Schoonhoven, 2012). Although patients receive support and information through SM, the ethical implications of such practices remain debatable (Ventola, 2014).

A 2011 survey found that 73.8% of clinicians utilised social networking, especially for personal purposes (95.1%), with Facebook (97.9%) being the most popular (Bosslet, Torke, Hickman, Terry, & Helft, 2011). Amongst Asian clinicians who use Twitter, 79% utilised the platform to access medical information, 71.4% of whom believed such services improved their clinical practice (Almaiman et al., 2015). Another study (Alsobayel, 2016) reported that 70.6% of healthcare professionals employed SM for professional development through networking and information exchange. SM use is also popular among medical students and junior clinicians (Hughes, Joshi, Lemoine, & Wareham, 2009; Sandars & Schroter, 2007; von Muhlen & Ohno-Machado, 2012). In a Spanish survey on paediatricians, 73% and 43% of respondents preferred YouTube and Facebook respectively (Gonzalez de Dios, Camino-Leon, & Ramos-Lizana, 2011).

Despite the great benefits of SM, there exist social and ethical implications toward patient privacy and care efficiency. Sharing non-therapeutic relationships with a patient risks violating the professional aspects of the patient-clinician relationship. Information shared through SM could be released to

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unauthorised third parties, thereby damaging the professional image of both clinician and organisation. Bosslet et al.’s (Bosslet et al., 2011) national survey reported that 5.1% of respondents have visited patients’ or family members’ profile, and 9% of respondents had received “friend” requests from patients. While respondents generally believed viewing and interacting with patients without breaching confidentiality was an acceptable practice, reports of unacceptable SM use have been documented elsewhere (Chretien, Greysen, Chretien, & Kind, 2009; Greysen et al., 2013). To ensure compliance to acceptable ethical standards, organisations and medical entities have actualized frameworks that address threats to clinical practice wrought by SM use (Guseh, Brendel, & Brendel, 2009; McMahon Sr, 2010).

Organisations seeking to leverage on communication platforms must understand the preferred communication tools of their staff. As the choice of tools vary amongst different clinicians. This approach not only maximises the potential of SM for rapid dissemination of information, but also helps to develop guidelines to restrict the usage of SM within organisations. To date, no studies investigating the patterns and preferences of a communication tool using clinician in a professional and ethical context have been conducted in Asia. This study sampled the clinicians from a tertiary psychiatric hospital in Singapore.

II. MATERIALS AND METHODS

Ethics clearance was obtained for conducting the study both from the Institutional Review Board and Domain Specific Review Boards. All procedures were conducted per the approved study protocol.

A. Study sample

The anonymous survey was emailed to all clinicians in the Institute of Mental Health (IMH) Singapore. No sample size calculations were involved due to the lack of studies under similar settings, instead all clinicians were given an opportunity to participate.

B. Survey

The survey was created on SPSS dimensions software and piloted among 10 non-study team members. Revisions were made based on comments from the pilot. The final questionnaire consisted of the following domains, 1) Demographics (age, current position, and years of service) 2) Type of mobile device and operating system used, 3) Messaging services used; exploring the different messaging services, the frequency of usage, attitude, purpose of use, and acceptability of such use 4) Social media use; the type of SM, frequency of use, and attitudes of use 5) Use of work email: frequency, patterns, and preferences of use, and preferred email length. 6) Preferred mode of communications; the preferred tool for receiving official information, and the acceptability of a clinician’s chat group.

C. Data collection

Through Microsoft Word’s mail merge function, emails were merged with unique IDs to anonymise respondent identities. An official email was sent to the clinicians by a non-study team member. The email carried a onetime password which the participant used to access the survey. Participants were given an option to opt out from the survey and stop receiving further reminders. Upon completing the survey, the participant received an invitation to collect a $20 Starbucks’s card. The survey was open for 2 months from Dec 2016 to Feb 2017, with 2 reminders sent monthly.

D. Statistical analysis

Descriptive statistics was used to summarise the demographic data. Comparison was made between differing seniority levels, classified as Non Specialist (NS; residents and medical officers), Early Career Psychiatrist (EP; associate consultants and consultants) and Senior Career Psychiatrist (SP; senior consultants).

III. RESULTS

The survey was sent to all clinicians in IMH (n = 196), of which 53 responses were obtained giving a total response rate of 27%.

A. Demographics of the respondents

Of the age groups, 34% of respondents fell under the 30-39 years age group (Table 1, 34%), followed by 40-49 years (30.2%), 21-29 years (20.8%), 50-59 years (13.2%) and 60-69 years (1.9%). Residents (1-3 years) and senior consultants contributed to 22.6% of responses (Table 1), 15.1% were medical officers, 11.3% were senior residents (4-5 years), 18.9% were consultants, 5.7% were associate consultants, and 3.2% were resident physicians. The groups Non Specialist, Early Career Psychiatrist, and Senior Career Psychiatrist contributed to 52.8%, 24.5%, and 22.6% respectively, with a median of 8 years of service in healthcare.

B. Type of mobile system

All respondents owned a mobile device, of which 50.9% used tablets (Table 1). Apple iOS utilisation was 52.8%, Android 41.5%, and more than one operating system was 5.7%. Of the tablet users, 66.7% preferred iOS, 18.5% Android, 7.4% Microsoft Windows, and 7.4 used multiple operating systems.

C. Patterns of use of messaging service

NS and EP agreed using messaging services for communicating patient’s movements within the hospital to colleagues (Table 3, NS 73.9% EP 80%) while SP had a conflicting views with 55.5% disagreeing to any such use. Contrary to the general acceptance reported by NS (65.2%) and EPs (90%), more SPs (55.5%) did not use messaging services to discuss clinical matters (patient handover, blood test results, etc.) with colleagues. 44.4% of SPs utilised the services several times a week while 43.5% of NSs and 40% of SPs reported daily usage of the service. SPs employed messaging services for sharing urgent clinical matters (66.6%) while NS (agree 43.5%, disagree 47.8%) and EPs (agree 50%, disagree 50%) lacked a clear consensus. SPs tend not to use messaging services to discuss patient’s social matters whereas EP (60%) and NS (43.5%) accepted using it. All 3 groups utilise the service to discuss patients’ clinical matters with senior clinicians (NS 65.2%, EP

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80%, and SP 55.5%). Similarly, 56% of NSs, 60% of EPs, and 66% of SPs used such services to access support groups when stressed about clinical work.

D. Attitude towards using messaging service for clinical purpose

All groups disagreed with using messaging services to discuss identifiable patient information (Table 4, NS 64.3%, EP 69.2%, SP 83.3%). EPs (38.5%) felt that non-identifiable data could be shared through messaging, NS’s (35.7% neutral and equal number agreed) were ambivalent, and SPs (41.7% each agreed and disagreed) lacked a clear consensus. Regardless of seniority, the majority (NS 96.4%, EP 100%, SP 83.3%) felt that a group chat for colleagues to discuss non-clinical matters such as business meetings, lunch, chatting, etc., was acceptable.

E. Patterns and perceptions regarding SM use

Facebook was the most accessed SM (NS 76%, EP 75%, SP 87.5%) followed by YouTube (Table 5, NS 8%, EP 25%, SP 12.5%). Instagram was the 2nd most popular SM amongst NSs. Regardless of seniority, most clinicians reported using SM for more than 4 years (NS 96%, EP 83.3%, SP 62.6%). All 3 groups admitted that they were somewhat dependent on SM (NS 48%, EP 50%, SP 50%); 8% of NSs and 8.3% EPs admitted to heavy dependency. While the majority gave neutral responses (NP 46.4%, EP 46.2%, SP 58.3%), EPs felt that SM created more stress than benefit (NS 25%, EP 46.2%, SP 16.7%).

When asked if it is acceptable to “friend” a colleague on SM, the majority voted “Agree/strongly agree” (Table 5, NS 89.3%, EP 84.6%, SP 75%). All 3 groups agreed that it was acceptable to be friends with other hospital staff on SM (Table 2). 58.3% of SPs and 53.8% of EPs dismissed the idea of “friending” pharmaceutical representatives while NS were neutral (39.3%) or agreeable (46.5%).

F. Usage patterns of emails for official communications

Contrary to SPs who access work email twice-hourly (Table 6), majority of NSs (46.4%) and EPs (30.8%) access emails twice a day on weekdays. On weekends all 3 groups accessed work emails at least once a day (Table 6). The majority of clinicians reported using their mobile device (NS 75%, EP 92%, SP 83.3%) and not their tablet to access emails (NS 85.7%, EP 92.3%, SP 100%).

Majority felt overwhelmed by emails and the information that comes with it (NS 53.6%, EP 53.9%, SP 50%) and agreed that it is stressful to handle the volume of emails received daily (NS 53.6%, EP 53.9%, SP 41.7%). NSs/EPs (NS 53.6% EP 53.8%) and SPs (66.7%) felt that the most effective length of an email to hold their attention is between 51 to 100 words and less than 50 words.

G. Preferred mode of communication

For straightforward decision-making and non-clinical communication, emails were preferred over calls and messaging systems by 84.6% of EPs and 83.3% of SPs (Table 7). NSs help equal preferences for messaging services and emails. In contrast, 53.6% NSs preferred direct calls over emails and messages while EPs (53.8%) and SPs (83.3%) preferred emails over other services. 53.6% of NSs voted for emails over department meetings, weekly education meetings, messaging for communicating policy, and other non-urgent work matters. EPs preferred department business meetings (30.8%), followed by emails (23.1%), weekly face-to-face briefing (15.4%), and the rest of the other services. Departmental business meetings and emails were equally preferred by SPs. When asked to rate their interest level for a hospital-wide clinicians chat group using a 5-point Likert scale, most clinicians inclined towards the notion that it is a bad idea (Table 9) or recorded a neutral response (SP 41.7%).

IV. DISCUSSION

Through this survey, we examined the patterns of use and attitudes towards adopting various platforms for official communication with an intention to improve communication processes at an organisation level. The finding that all clinicians owned a mobile phone is aligned with the reported penetration rates of 90% and 98.9% for Singapore (Todayonline, 2015) and the United Kingdom, respectively (Mohammad H Mobasher et al., 2015).

The majority of respondents used Whatsapp for personal and professional communication. Despite this preference, Whatsapp was not favoured for work communication by EPs and SPs. Similar responses are recorded in previous surveys elsewhere, where clinicians preferred SM for personal over professional purposes (Bossett et al., 2011; Wheeler, Said, Prucz, Rodrich, & Mathes, 2011). Whatsapp is endorsed clinically and academically as an inexpensive and efficient method for communication amongst clinicians for patient management (Gulacti, Lok, & Celik, 2016; Sidhoum et al., 2016; Wani, Rabah, AlFadil, Dewanjee, & Najmi, 2013). The disparity in responses between NSs favouring Whatsapp for official communication contrary to EPs and SPs preference for traditional methods such as emails is surprising, yet comprehensible given the changing trend in communication patterns among different age groups. The purpose of this platform for sharing identifiable patient information was unanimous and demonstrated awareness towards the medico-legal ramifications of such practices. There existed a difference in opinion regarding sharing of non-identifiable patient information for clinical use among different seniority level with EPs alone favouring the idea. Although endorsed by international literature to be an efficient platform (Kamel Boulos, Giustini, & Wheeler, 2016), the clinicians felt apprehensive about adopting it. Hence, guidelines for the type of information that can be shared through such platforms might create a common understanding and improve clinical communications.

A previous survey conducted abroad has identified Facebook to be the most popular SM, a result that aligned with our current study (Bossett et al., 2011). Clinicians were willing to “friend” fellow colleagues of different professional groups or grades but they were hesitant to do so with pharmaceutical representatives. The respondents were aware of the sensitivities of befriending pharmaceutical representatives in SMs. Organisations can leverage on the clinicians’ interest in using SM by creating a

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community within the organisation; for example, Facebook’s Workplace. It will encourage better collaboration among the clinicians and non-sensitive information sharing such as hospital events or educational matters.

In the era of SM, emails remain the prime tools for workplace communication and are utilised by healthcare professionals for seamless patient care (Brauchli et al., 2004; Deodhar, 2002). In the healthcare setting, emails have undoubtedly revolutionised communication through information sharing, improved quality of care, and overall efficiency of the system (Car & Sheikh, 2004; Goodyear-Smith, Wearn, Everts, Huggard, & Halliwell, 2005). Sampson, Barbour, and Wilson (2016) conducted a thematic analysis of interviews among clinicians and evidenced the general positive attitude towards the medium in managing workloads and improving patient care. Our study demonstrated a general acceptance among respondents towards adopting emails for both clinical and non-clinical matters. Of concern was the overwhelming and stressful nature of daily email volume, previously noted as disadvantageous (Sampson, Barbour, & Wilson, 2016). Respondents preferred emails with 100 words or fewer, citing effectiveness in capturing their attention. Longer emails received minimal attention – an observation noted in previous studies among clinicians (Karhula et al., 2011). Despite this, clinicians at the forefront of patient care reported checking their emails every two hours each day. While this study is unable to determine the long-term implications of managing high email volumes on top of clinical work, the potential negative impact cannot be disregarded. Therefore, to ensure the delivery of important information, organisational strategies can include keeping email announcements short and succinct.

Another noteworthy observation is the positive response towards clinician chat groups. Such platforms can be utilised by organisations so long as ethical communication guidelines remain enforceable. The successful implementation of similar discussion forums have been documented in numerous studies (Abidi, Hussini, Sriraj, Thienthong, & Finley, 2009; Curran & Abidi, 2007; Stewart & Abidi, 2012), each one evidenced as an active, healthy knowledge and professional bonding platforms for clinicians.

Despite the enriching nature of the findings, respondents were sampled from a single, mono-discipline healthcare institution. Resultantly, the findings cannot be generalised to clinicians of other disciplines without further study. The quantitative nature of the survey also limits its ability to identify underlying rationales responsible for observed behaviours (e.g., why clinicians prefer certain platforms over others). Aside from examining the preferences of other professional groups that comprise the healthcare industry, mixed quantitative-qualitative approaches can be utilised to close the aforementioned gaps of such studies.

This study has highlighted clinician’s preferences for official communication in Singapore. Clinicians are aware of patient’s data confidentiality and are also mindful of the ethical implications when interacting on SM. In view of the continued improvement of patient care, healthcare institutions can leverage on existing communication platforms with strict guidelines on their usage.

### Table 1: Demographics of the survey respondents

Table 1 shows the age distribution with majority being 30 to 39 years old and the seniority level with senior consultants and residents forming the majority.

<table>
<thead>
<tr>
<th>What is your age group?</th>
<th>Total (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 to 29</td>
<td>11(20.8)</td>
</tr>
<tr>
<td>30 to 39</td>
<td>18(34.0)</td>
</tr>
<tr>
<td>40 to 49</td>
<td>16(30.2)</td>
</tr>
<tr>
<td>50 to 59</td>
<td>7(13.2)</td>
</tr>
<tr>
<td>60 to 69</td>
<td>1(1.9)</td>
</tr>
<tr>
<td>70 to 79</td>
<td>0(0.0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Seniority Categorization</th>
<th>What is your current position?</th>
<th>Total (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical officer</td>
<td>8(15.1)</td>
<td></td>
</tr>
<tr>
<td>Resident (Year 1 to 3)</td>
<td>12(22.6)</td>
<td></td>
</tr>
<tr>
<td>Senior Resident (Year 4 to 5)</td>
<td>6(11.3)</td>
<td></td>
</tr>
<tr>
<td>Resident Physician (all grades)</td>
<td>2(3.8)</td>
<td></td>
</tr>
<tr>
<td>Early Career Psychiatrist (24.5%)</td>
<td>3(5.7)</td>
<td></td>
</tr>
<tr>
<td>Consultant</td>
<td>10(18.9)</td>
<td></td>
</tr>
<tr>
<td>Senior Career Psychiatrist (22.6%)</td>
<td>12(22.6)</td>
<td></td>
</tr>
</tbody>
</table>

### Table 2: Utilisation of messaging services by the doctors

<table>
<thead>
<tr>
<th>Rank in order of frequency use, which of these services do you use for personal communication?</th>
<th>Total (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non Specialist (N, %)</td>
<td>Early Career Psychiatrist (N, %)</td>
</tr>
<tr>
<td>Phone SMS</td>
<td>10(100.0)</td>
</tr>
<tr>
<td>WhatsApp</td>
<td>27(96.4)</td>
</tr>
<tr>
<td>Others</td>
<td>1(3.6)</td>
</tr>
<tr>
<td>Line</td>
<td>0(0.0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rank in order of frequency use, which of these services do you use for work/business communication?</th>
<th>Total (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non Specialist (N, %)</td>
<td>Early Career Psychiatrist (N, %)</td>
</tr>
<tr>
<td>Phone SMS</td>
<td>9(32.1)</td>
</tr>
<tr>
<td>WhatsApp</td>
<td>17(60.7)</td>
</tr>
<tr>
<td>Others</td>
<td>2(7.1)</td>
</tr>
<tr>
<td>Line</td>
<td>0(0.0)</td>
</tr>
</tbody>
</table>

### Table 3: Purpose of employing messaging services for clinical use

<table>
<thead>
<tr>
<th>You use messaging services to communicate with your colleagues on patient’s location within the hospital.</th>
<th>Total (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non Specialist (N, %)</td>
<td>Early Career Psychiatrist (N, %)</td>
</tr>
<tr>
<td>Disagree (or strongly disagree)</td>
<td>3(13.0)</td>
</tr>
<tr>
<td>Neutral</td>
<td>3(13.0)</td>
</tr>
<tr>
<td>Agree (or strongly agree)</td>
<td>17(73.9)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>You use messaging services to communicate with your colleagues on patient’s clinical matters (e.g. handover, blood test results etc.).</th>
<th>Total (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non Specialist (N, %)</td>
<td>Early Career Psychiatrist (N, %)</td>
</tr>
<tr>
<td>Disagree (or strongly disagree)</td>
<td>3(13.0)</td>
</tr>
<tr>
<td>Neutral</td>
<td>3(13.0)</td>
</tr>
<tr>
<td>Agree (or strongly agree)</td>
<td>17(73.9)</td>
</tr>
</tbody>
</table>
If you use messaging services to communicate with your colleagues on patient’s urgent clinical matters.

<table>
<thead>
<tr>
<th>Agreement Level</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree (or strongly disagree)</td>
<td>23(100.0)</td>
</tr>
<tr>
<td>Neutral</td>
<td>10(100.0)</td>
</tr>
<tr>
<td>Agree (or strongly agree)</td>
<td>11(47.8)</td>
</tr>
</tbody>
</table>

You use messaging services to communicate with your colleagues on patient’s social matters (e.g. family’s presence, etc.).

<table>
<thead>
<tr>
<th>Agreement Level</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree (or strongly disagree)</td>
<td>23(100.0)</td>
</tr>
<tr>
<td>Neutral</td>
<td>10(100.0)</td>
</tr>
<tr>
<td>Agree (or strongly agree)</td>
<td>11(47.8)</td>
</tr>
</tbody>
</table>

You use messaging services to communicate with your senior colleagues on patient’s clinical matters (e.g. seeking clearance for discharge, prescription, etc.).

<table>
<thead>
<tr>
<th>Agreement Level</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree (or strongly disagree)</td>
<td>23(100.0)</td>
</tr>
<tr>
<td>Neutral</td>
<td>10(100.0)</td>
</tr>
<tr>
<td>Agree (or strongly agree)</td>
<td>11(47.8)</td>
</tr>
</tbody>
</table>

You use messaging services to communicate with your colleagues on patient’s urgent clinical matters.

<table>
<thead>
<tr>
<th>Agreement Level</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree (or strongly disagree)</td>
<td>23(100.0)</td>
</tr>
<tr>
<td>Neutral</td>
<td>10(100.0)</td>
</tr>
<tr>
<td>Agree (or strongly agree)</td>
<td>11(47.8)</td>
</tr>
</tbody>
</table>

You use messaging services to communicate with your support group when stressed about clinical work (e.g. difficult encounters with patients or their families, etc.).

<table>
<thead>
<tr>
<th>Agreement Level</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree (or strongly disagree)</td>
<td>23(100.0)</td>
</tr>
<tr>
<td>Neutral</td>
<td>10(100.0)</td>
</tr>
<tr>
<td>Agree (or strongly agree)</td>
<td>11(47.8)</td>
</tr>
</tbody>
</table>

If you do use messaging services to discuss clinical matters, how often do you use them?

<table>
<thead>
<tr>
<th>Agreement Level</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dials on working days</td>
<td>10(100.0)</td>
</tr>
<tr>
<td>Several times a week</td>
<td>7(30.4)</td>
</tr>
<tr>
<td>Once a week</td>
<td>3(13.0)</td>
</tr>
<tr>
<td>Less than once a week</td>
<td>3(13.0)</td>
</tr>
</tbody>
</table>

Table 4: Attitude/awareness towards engaging messaging service for clinical purpose

<table>
<thead>
<tr>
<th>Level</th>
<th>Non-Specialist (N, %)</th>
<th>Early Career Psychiatrist (N, %)</th>
<th>Senior Career Psychiatrist (N, %)</th>
<th>Total (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree (or strongly agree)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disagree (or strongly disagree)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It is acceptable to discuss clinical matters with identifiable patient data on messaging services (e.g. Patient Tan Ah Kow NRIC1234567A with schizophrenia now admitted to Ward XX).

<table>
<thead>
<tr>
<th>Agreement Level</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree (or strongly disagree)</td>
<td>18(64.3)</td>
</tr>
<tr>
<td>Neutral</td>
<td>7(25.0)</td>
</tr>
<tr>
<td>Agree (or strongly agree)</td>
<td>5(18.5)</td>
</tr>
</tbody>
</table>

It is acceptable to discuss clinical matters with non-identifiable patient data on messaging services (e.g. “OMG my borderline patient just cut himself again”).

<table>
<thead>
<tr>
<th>Agreement Level</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree (or strongly disagree)</td>
<td>8(28.5)</td>
</tr>
<tr>
<td>Neutral</td>
<td>10(35.7)</td>
</tr>
<tr>
<td>Agree (or strongly agree)</td>
<td>10(35.7)</td>
</tr>
</tbody>
</table>

It is acceptable to set up group chats for colleagues for non-clinical matters (e.g. business meetings, lunch, chatting).

<table>
<thead>
<tr>
<th>Agreement Level</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree (or strongly disagree)</td>
<td>0(0.0)</td>
</tr>
<tr>
<td>Neutral</td>
<td>1(3.6)</td>
</tr>
<tr>
<td>Agree (or strongly agree)</td>
<td>27(96.4)</td>
</tr>
</tbody>
</table>

Table 5: Patterns of social media use among doctors and attitude and preferences of SM use for professional purpose

<table>
<thead>
<tr>
<th>Social Media</th>
<th>Non specialist (N, %)</th>
<th>Early Career Psychiatrist (N, %)</th>
<th>Senior Career Psychiatrist (N, %)</th>
<th>Total (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which social media do you access most often?</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facebook</td>
<td>25(100.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twitter</td>
<td>12(100.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instagram</td>
<td>8(100.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YouTube</td>
<td>7(100.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

How long have you been using social media?

<table>
<thead>
<tr>
<th>Time</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 2 years</td>
<td>6(13.3)</td>
</tr>
<tr>
<td>2 to 4 years</td>
<td>3(7.5)</td>
</tr>
<tr>
<td>More than 4 years</td>
<td>5(11.1)</td>
</tr>
</tbody>
</table>

How dependent are you on social media?

<table>
<thead>
<tr>
<th>Level</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>25(100.0)</td>
</tr>
<tr>
<td>Somewhat</td>
<td>12(100.0)</td>
</tr>
<tr>
<td>Moderately</td>
<td>6(100.0)</td>
</tr>
<tr>
<td>Heavily</td>
<td>2(100.0)</td>
</tr>
</tbody>
</table>

Do you think that communication through social media creates more stress than benefit?

<table>
<thead>
<tr>
<th>Agreement Level</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree (or strongly disagree)</td>
<td>28(100.0)</td>
</tr>
<tr>
<td>Neutral</td>
<td>13(100.0)</td>
</tr>
<tr>
<td>Agree (or strongly agree)</td>
<td>53(100.0)</td>
</tr>
</tbody>
</table>

Table: Attitude/awareness towards engaging messaging service for clinical purpose

<table>
<thead>
<tr>
<th>Level</th>
<th>Non-Specialist (N, %)</th>
<th>Early Career Psychiatrist (N, %)</th>
<th>Senior Career Psychiatrist (N, %)</th>
<th>Total (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree (or strongly agree)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disagree (or strongly disagree)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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It is acceptable to be “friends” on social media between peers.

<table>
<thead>
<tr>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree (or strongly disagree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>28(100.0)</td>
<td>13(100.0)</td>
<td>12(100.0)</td>
</tr>
</tbody>
</table>

It is acceptable to be “friends” on social media between senior and junior doctors with 1 job grade difference (e.g. AC and MO).

<table>
<thead>
<tr>
<th>Agree (or strongly agree)</th>
<th>Neutral</th>
<th>Disagree (or strongly disagree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>23(82.1)</td>
<td>8(61.5)</td>
<td>9(75.0)</td>
</tr>
</tbody>
</table>

It is acceptable to be “friends” on social media between senior and junior doctors with more than 1 job grade difference (e.g. SC and MO).

<table>
<thead>
<tr>
<th>Agree (or strongly agree)</th>
<th>Neutral</th>
<th>Disagree (or strongly disagree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20(71.4)</td>
<td>7(53.9)</td>
<td>6(50)</td>
</tr>
</tbody>
</table>

It is acceptable to be “friends” on social media between RO and staff.

<table>
<thead>
<tr>
<th>Agree (or strongly agree)</th>
<th>Neutral</th>
<th>Disagree (or strongly disagree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>17(60.7)</td>
<td>8(61.5)</td>
<td>8(66.6)</td>
</tr>
</tbody>
</table>

It is acceptable to be “friends” on social media between doctors and pharmaceutical representatives.

<table>
<thead>
<tr>
<th>Agree (or strongly agree)</th>
<th>Neutral</th>
<th>Disagree (or strongly disagree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>13(46.5)</td>
<td>3(23.1)</td>
<td>4(33.3)</td>
</tr>
</tbody>
</table>

It is acceptable to be “friends” on social media between doctors and allied health/nursing colleagues.

<table>
<thead>
<tr>
<th>Agree (or strongly agree)</th>
<th>Neutral</th>
<th>Disagree (or strongly disagree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0(0.0)</td>
<td>1(7.7)</td>
<td>1(8.3)</td>
</tr>
</tbody>
</table>

Disagree (or strongly disagree) Neutral | Agree (or strongly agree) |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0(0.0)</td>
<td>1(7.7)</td>
</tr>
</tbody>
</table>

Strongly disagree | Agree (or strongly agree) |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4(14.3)</td>
<td>5(38.5)</td>
</tr>
</tbody>
</table>

Neutral | Agree (or strongly agree) |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>24(85.7)</td>
<td>7(53.9)</td>
</tr>
</tbody>
</table>

Table 6: Emails: the patterns and mode of use and effectiveness of E-mail for disseminating official information

<table>
<thead>
<tr>
<th>How frequent do you check your work email on weekdays?</th>
<th>Non specialist (N, %)</th>
<th>Early Career Psychiatrist (N, %)</th>
<th>Senior Career Psychiatrist (N, %)</th>
<th>Total (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than half hourly</td>
<td>13(46.4)</td>
<td>6(37.5)</td>
<td>5(32.1)</td>
<td>24(45.3)</td>
</tr>
<tr>
<td>Half hourly</td>
<td>1(3.6)</td>
<td>1(6.3)</td>
<td>1(8.3)</td>
<td>3(5.7)</td>
</tr>
<tr>
<td>Hourly</td>
<td>2(7.1)</td>
<td>2(15.4)</td>
<td>2(16.7)</td>
<td>6(11.3)</td>
</tr>
<tr>
<td>2-hourly</td>
<td>4(14.3)</td>
<td>3(23.1)</td>
<td>6(50.0)</td>
<td>13(24.5)</td>
</tr>
<tr>
<td>Twice a day</td>
<td>13(46.4)</td>
<td>4(30.8)</td>
<td>1(8.3)</td>
<td>18(34.0)</td>
</tr>
<tr>
<td>Once a day</td>
<td>5(17.9)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>5(9.4)</td>
</tr>
<tr>
<td>Less than one a day</td>
<td>1(3.6)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>1(1.9)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How often do you check your work email on weekends?</th>
<th>Non specialist (N, %)</th>
<th>Early Career Psychiatrist (N, %)</th>
<th>Senior Career Psychiatrist (N, %)</th>
<th>Total (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
</tr>
<tr>
<td>Less than half hourly</td>
<td>2(7.1)</td>
<td>1(7.7)</td>
<td>0(0.0)</td>
<td>3(5.7)</td>
</tr>
<tr>
<td>Half hourly</td>
<td>0(0.0)</td>
<td>1(7.7)</td>
<td>0(0.0)</td>
<td>1(1.9)</td>
</tr>
<tr>
<td>Hourly</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>1(8.3)</td>
<td>1(1.9)</td>
</tr>
<tr>
<td>2-hourly</td>
<td>1(3.6)</td>
<td>0(0.0)</td>
<td>3(25.0)</td>
<td>4(7.5)</td>
</tr>
<tr>
<td>Twice a day</td>
<td>2(7.1)</td>
<td>4(30.8)</td>
<td>3(25.0)</td>
<td>9(17.0)</td>
</tr>
<tr>
<td>Once a day</td>
<td>11(39.3)</td>
<td>4(30.8)</td>
<td>3(25.0)</td>
<td>18(34.0)</td>
</tr>
<tr>
<td>Less than one a day</td>
<td>7(25.0)</td>
<td>1(7.7)</td>
<td>1(8.3)</td>
<td>9(17.0)</td>
</tr>
<tr>
<td>More</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
</tr>
</tbody>
</table>

Do you access work e-mail on your mobile device?

<table>
<thead>
<tr>
<th>Non specialist (N, %)</th>
<th>Early Career Psychiatrist (N, %)</th>
<th>Senior Career Psychiatrist (N, %)</th>
<th>Total (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>21(75.0)</td>
<td>12(92.3)</td>
<td>10(83.3)</td>
</tr>
<tr>
<td>No</td>
<td>7(25.0)</td>
<td>5(7.7)</td>
<td>1(7.7)</td>
</tr>
</tbody>
</table>

Do you access work e-mail on your tablet?

<table>
<thead>
<tr>
<th>Non specialist (N, %)</th>
<th>Early Career Psychiatrist (N, %)</th>
<th>Senior Career Psychiatrist (N, %)</th>
<th>Total (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>4(14.3)</td>
<td>1(7.7)</td>
<td>0(0.0)</td>
</tr>
<tr>
<td>No</td>
<td>24(85.7)</td>
<td>12(92.3)</td>
<td>12(100.0)</td>
</tr>
</tbody>
</table>

How effective is work email for clinical policy matters?

<table>
<thead>
<tr>
<th>Non specialist (N, %)</th>
<th>Early Career Psychiatrist (N, %)</th>
<th>Senior Career Psychiatrist (N, %)</th>
<th>Total (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I delete without opening</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
</tr>
<tr>
<td>I just glance at it</td>
<td>11(39.3)</td>
<td>2(15.4)</td>
<td>1(8.3)</td>
</tr>
<tr>
<td>I read it quickly from start to end</td>
<td>14(50.0)</td>
<td>7(53.8)</td>
<td>9(75.0)</td>
</tr>
<tr>
<td>I read it</td>
<td>3(10.7)</td>
<td>4(30.8)</td>
<td>2(16.7)</td>
</tr>
</tbody>
</table>

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How effective is work email for education events matters?

<table>
<thead>
<tr>
<th></th>
<th>Non specialist (N, %)</th>
<th>Early Career Psychiatrist (N, %)</th>
<th>Senior Career Psychiatrist (N, %)</th>
<th>Total (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I delete without opening</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I just glance at it</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How effective is work email for hospital events matters?</td>
<td>Non specialist (N, %)</td>
<td>Early Career Psychiatrist (N, %)</td>
<td>Senior Career Psychiatrist (N, %)</td>
<td>Total (N, %)</td>
</tr>
<tr>
<td>I delete without opening</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I just glance at it</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Table 7: Preferred channel for communication for clinical and non-clinical information

<table>
<thead>
<tr>
<th>Non specialist (N, %)</th>
<th>Early Career Psychiatrist (N, %)</th>
<th>Senior Career Psychiatrist (N, %)</th>
<th>Total (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMS/messaging</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-mail</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calls</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Which is your preferred channel of electronic communication for simple non-clinical work related communication and straight forward decision making?

<table>
<thead>
<tr>
<th>Which is your preferred channel of electronic communication for simple non-clinical work related communication and straight forward decision making?</th>
<th>Non specialist (N, %)</th>
<th>Early Career Psychiatrist (N, %)</th>
<th>Senior Career Psychiatrist (N, %)</th>
<th>Total (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMS/messaging</td>
<td>12(42.9)</td>
<td>1(7.7)</td>
<td>1(8.3)</td>
<td>14(26.4)</td>
</tr>
<tr>
<td>E-mail</td>
<td>12(42.9)</td>
<td>11(84.6)</td>
<td>10(83.3)</td>
<td>33(62.3)</td>
</tr>
<tr>
<td>Calls</td>
<td>4(14.3)</td>
<td>1(7.7)</td>
<td>1(8.3)</td>
<td>6(11.3)</td>
</tr>
</tbody>
</table>

Which is your preferred channel of electronic communication for simple clinical related communication and straight forward decision making?

<table>
<thead>
<tr>
<th>Which is your preferred channel of electronic communication for simple clinical related communication and straight forward decision making?</th>
<th>Non specialist (N, %)</th>
<th>Early Career Psychiatrist (N, %)</th>
<th>Senior Career Psychiatrist (N, %)</th>
<th>Total (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMS/messaging</td>
<td>7(25.0)</td>
<td>2(15.4)</td>
<td>0(0.0)</td>
<td>9(17.0)</td>
</tr>
<tr>
<td>E-mail</td>
<td>6(21.4)</td>
<td>7(53.8)</td>
<td>10(83.3)</td>
<td>23(43.4)</td>
</tr>
<tr>
<td>Calls</td>
<td>15(53.6)</td>
<td>4(30.8)</td>
<td>2(16.7)</td>
<td>21(39.6)</td>
</tr>
</tbody>
</table>

What do you think is the most effective length of an email to hold your attention?

<table>
<thead>
<tr>
<th>What do you think is the most effective length of an email to hold your attention?</th>
<th>Non specialist (N, %)</th>
<th>Early Career Psychiatrist (N, %)</th>
<th>Senior Career Psychiatrist (N, %)</th>
<th>Total (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 50 words</td>
<td>10(35.7)</td>
<td>5(38.5)</td>
<td>8(66.7)</td>
<td>23(43.4)</td>
</tr>
<tr>
<td>51 to 100 words</td>
<td>15(53.6)</td>
<td>7(53.8)</td>
<td>4(33.3)</td>
<td>26(49.1)</td>
</tr>
<tr>
<td>101 to 200 words</td>
<td>2(7.1)</td>
<td>0(0.0)</td>
<td>0(0.0)</td>
<td>2(3.8)</td>
</tr>
<tr>
<td>I want all the fullest details</td>
<td>1(3.6)</td>
<td>1(7.7)</td>
<td>0(0.0)</td>
<td>2(3.8)</td>
</tr>
</tbody>
</table>

I feel overwhelmed by the e-mail and information that comes with it.

<table>
<thead>
<tr>
<th>I feel overwhelmed by the e-mail and information that comes with it.</th>
<th>Non specialist (N, %)</th>
<th>Early Career Psychiatrist (N, %)</th>
<th>Senior Career Psychiatrist (N, %)</th>
<th>Total (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree (or strongly disagree)</td>
<td>4(14.3)</td>
<td>2(15.4)</td>
<td>3(25.0)</td>
<td>9(17.0)</td>
</tr>
<tr>
<td>Neutral</td>
<td>9(32.1)</td>
<td>4(30.8)</td>
<td>3(25.0)</td>
<td>16(30.2)</td>
</tr>
<tr>
<td>Agree (or strongly agree)</td>
<td>15(53.6)</td>
<td>7(53.8)</td>
<td>6(50.0)</td>
<td>28(52.8)</td>
</tr>
</tbody>
</table>

I feel stressful to handle the volume of official e-mails I receive every day.

<table>
<thead>
<tr>
<th>I feel stressful to handle the volume of official e-mails I receive every day.</th>
<th>Non specialist (N, %)</th>
<th>Early Career Psychiatrist (N, %)</th>
<th>Senior Career Psychiatrist (N, %)</th>
<th>Total (N, %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree (or strongly disagree)</td>
<td>6(21.4)</td>
<td>3(23.1)</td>
<td>4(33.3)</td>
<td>13(24.6)</td>
</tr>
</tbody>
</table>
The authors would like to thank all clinicians for their participation and IMH Research Division for their kind help in setting up the survey online. We would like to acknowledge the funders of the study; Research Seed Funding, for an amount of $3,200 to support this study.

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Correspondence Author – Christopher Cheok, Ph.D., Chris_CHEOK@imh.com.sg, 63893890.
Awareness, use and barriers to modern contraceptives among inner-city mothers attending child welfare clinic at selected health facilities in Abeokuta, Nigeria.

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Abstract
Contraceptive use among women is associated with reduced maternal morbidity and mortality worldwide. Study assessed women awareness of modern contraceptives, its use and barriers among inner-city mothers attending child welfare clinic in selected hospitals in Abeokuta. This is a descriptive cross-sectional study using convenient sampling to recruit 150 women attending Child Welfare Clinic in three selected health facilities in Abeokuta. Questionnaires with open-ended questions were used to obtain information from respondents after obtaining ethical approval and written consent. Data obtained was analysed using SPSS version 21. Findings from the study revealed that awareness of modern contraceptive among the respondents is high (94%), however its use is low (41.3%). The desire to have more children (47.7%) was the major reason for non-use of modern contraceptives. Lack of communication between couples with regards to sex (24%) and fear of side effects (27.3%) were the main barriers to using contraceptive. Women should be encouraged to communicate effectively with their husbands. Furthermore, healthcare providers should properly evaluate clients seeking contraception and educate them on side effects to improve adherence to contraceptive use.

Key words: Awareness, use, barriers, modern contraceptive, Inner-city mothers

I. INTRODUCTION

Unplanned and unexpected pregnancy continues to pose major reproductive health challenge in women of child bearing age especially in sub-Saharan Africa with resultant cases of abortions, infections and untimely death in worst situations.¹² Unwanted pregnancy accounts for 30% of all births in sub-Saharan Africa.¹³ Since this pregnancy is unplanned, women may tend towards its termination. In Nigeria, abortion is illegal under most health conditions; hence an increase in the rate of unexpected pregnancies would lead to rise in the incidence of unsafe abortion thereby increasing the number of deaths resulting unsafe abortion. ² Reported death resulting from abortion-related mortality and morbidity accounted for 15% of all maternal death, therefore use of contraceptive was prioritized as a key intervention.⁵⁻⁶.

Modern contraceptives has since been introduced and integrated into many national population and developmental programs.⁷ Modern contraceptives includes devices, drugs or agents such as condoms, injectables, oral pills, intra-uterine device, implants and surgical procedures like sterilization which act by preventing conception thereby enabling the woman to plan and space the birth of her children.⁸ This in turn reduces abortions rate, maternal mortality and also improves maternal and child health.⁹

Despite the efforts of governmental and non-governmental agencies in creating awareness on the benefits of modern contraceptive, its use is still low in many parts of sub-Saharan Africa. ⁴ In Nigeria, prevalence of contraceptive use is as low as 15% and even lower in some rural areas of the country.¹⁰ Factors within women’s socio-cultural context could act as barriers towards the use of modern contraceptives. Hence this study was aimed to examine the awareness, use and barriers to modern contraceptives among inner-city mothers in Abeokuta, Nigeria, and also to determine whether a statistical difference between awareness of modern contraceptive (ever heard of) and current use of modern contraceptive. Findings obtained from this study would add to existing body of knowledge and also provide insight to other measures which could be adopted in order to promote the use of modern contraceptive.

II. METHODS
This is a descriptive, cross-sectional study aimed to determine mothers’ awareness, use and barriers to modern contraceptive. 150 mothers who were registered with and also attended child welfare at any of the three selected health facilities were conveniently recruited for the purpose of this study. Ethical approval was obtained from Babcock University Health Research and Ethical Committee (BUHREC). Participants were duly informed and verbal consent was obtained. Questionnaire with closed-ended questions which assessed awareness, use and barriers to modern contraceptive was administered to the participants. Content and face validity was ensured through extensive review of literature and clarification of sentences by experts in the field of study. Participants were guided on completion of the questionnaire. Completed questionnaires were retrieved, coded and analysed using descriptive statistics of tables with tables and percentages. Study hypothesis was tested using inferential statistics of chi-square and level of significance set at 0.05. Statistical Package for Social Sciences (SPSS version 21.0) was used.

III. RESULTS

Table 1: Socio-demographic characteristics of the respondents (n=150)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency (F)</th>
<th>Percentages (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-27</td>
<td>43</td>
<td>28.7</td>
</tr>
<tr>
<td>28-37</td>
<td>93</td>
<td>62</td>
</tr>
<tr>
<td>38-47</td>
<td>14</td>
<td>9.3</td>
</tr>
<tr>
<td>Level of Education:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No formal education</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Primary education</td>
<td>13</td>
<td>8.7</td>
</tr>
<tr>
<td>Secondary education</td>
<td>42</td>
<td>28</td>
</tr>
<tr>
<td>Diploma</td>
<td>28</td>
<td>18.7</td>
</tr>
<tr>
<td>Graduate</td>
<td>53</td>
<td>35.3</td>
</tr>
<tr>
<td>Postgraduate</td>
<td>11</td>
<td>7.3</td>
</tr>
<tr>
<td>Religion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Christianity</td>
<td>106</td>
<td>70.7</td>
</tr>
<tr>
<td>Islam</td>
<td>42</td>
<td>28</td>
</tr>
<tr>
<td>Traditional</td>
<td>2</td>
<td>1.3</td>
</tr>
<tr>
<td>Number of children had:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3</td>
<td>133</td>
<td>88.7</td>
</tr>
<tr>
<td>4-6</td>
<td>17</td>
<td>11.3</td>
</tr>
<tr>
<td>7-9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>≥10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Desired number of children:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3</td>
<td>90</td>
<td>60</td>
</tr>
<tr>
<td>4-6</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>7-9</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>≥10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yoruba</td>
<td>118</td>
<td>79.7</td>
</tr>
<tr>
<td>Igbo</td>
<td>23</td>
<td>15.3</td>
</tr>
<tr>
<td>Hausa</td>
<td>7</td>
<td>4.7</td>
</tr>
<tr>
<td>Others</td>
<td>2</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Table 1 above shows that most of the women sampled (62%) were between 28 and 37 years old. 53 participants (35.3%) are university graduates. 70.6% respondents are Christians. Majority of the participants 133 (88.7%) have previously had 1-3 number of children while 17 respondents (11.3%) have had 4-6 number of children. However, 60 respondents (40%) desire to have at least four number of children and above. Majority of the respondents (79.7%) are from Yoruba ethnic group. Study setting is of Yoruba origin.

Table 2: Awareness of Modern contraceptives among the respondents (n=150)

<table>
<thead>
<tr>
<th>Questions</th>
<th>Frequency (F)</th>
<th>Percentages (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you ever heard about modern contraceptives?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>141</td>
<td>94</td>
</tr>
<tr>
<td>No</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Modern contraceptive deals with:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Child spacing</td>
<td>62</td>
<td>41.3</td>
</tr>
<tr>
<td>Prevention of pregnancy</td>
<td>83</td>
<td>55.3</td>
</tr>
<tr>
<td>I don’t know</td>
<td>5</td>
<td>3.3</td>
</tr>
<tr>
<td>What is your source information?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>School</td>
<td>12</td>
<td>8.0</td>
</tr>
<tr>
<td>Health facilities like hospital</td>
<td>116</td>
<td>77.3</td>
</tr>
<tr>
<td>Friends</td>
<td>10</td>
<td>6.7</td>
</tr>
<tr>
<td>Electronic media</td>
<td>9</td>
<td>6.0</td>
</tr>
<tr>
<td>Others</td>
<td>3</td>
<td>2.0</td>
</tr>
<tr>
<td>Which of these methods of modern contraceptives do you know?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condom</td>
<td>95</td>
<td>65.3</td>
</tr>
</tbody>
</table>
Table 2 above reveals the participants awareness of modern contraceptive. Majority of the participants 141 (94%) have heard about modern contraceptives. 83 respondents (55.3%) are of the opinion that modern contraceptive deals with pregnancy prevention while 62 respondents (41.3%) said that it deals with spacing of their children. 116 respondents (77.3%) got their information from various health facilities. Most of the respondents 95 (65.3%), 84(56%) and 71(47.3%) respectively affirmed that they know condoms, injectable and oral pills as the methods of modern contraceptives. Also 136 respondents affirmed that modern contraceptives are assessable at the health facilities.

Table 3: Use of Modern Contraceptives methods among the participants (n=150)

<table>
<thead>
<tr>
<th>Questions</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have you ever used any method of modern contraceptive? Yes</td>
<td>77</td>
<td>52</td>
</tr>
<tr>
<td>No</td>
<td>73</td>
<td>48</td>
</tr>
<tr>
<td>Are you currently using any contraceptive? Yes</td>
<td>62</td>
<td>41.3</td>
</tr>
<tr>
<td>No</td>
<td>88</td>
<td>58.7</td>
</tr>
<tr>
<td>If No, why? Desire for more children</td>
<td>42</td>
<td>47.7</td>
</tr>
<tr>
<td>None Availability</td>
<td>5</td>
<td>5.8</td>
</tr>
<tr>
<td>Spouse Refusal</td>
<td>15</td>
<td>17.0</td>
</tr>
<tr>
<td>Religion</td>
<td>3</td>
<td>3.4</td>
</tr>
<tr>
<td>Others</td>
<td>23</td>
<td>26.1</td>
</tr>
<tr>
<td>If you are currently using any contraceptive, which one?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condom</td>
<td>26</td>
<td>41.9</td>
</tr>
<tr>
<td>Injectable</td>
<td>14</td>
<td>22.6</td>
</tr>
<tr>
<td>Tablets</td>
<td>9</td>
<td>14.5</td>
</tr>
<tr>
<td>Intra-Uterine Contraceptive Device (IUCD)</td>
<td>10</td>
<td>16.1</td>
</tr>
<tr>
<td>Surgical</td>
<td>1</td>
<td>1.6</td>
</tr>
<tr>
<td>Implant</td>
<td>2</td>
<td>3.2</td>
</tr>
<tr>
<td>Why do you prefer the chosen method of contraceptive?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is effective</td>
<td>31</td>
<td>50.0</td>
</tr>
<tr>
<td>It is safe</td>
<td>8</td>
<td>12.9</td>
</tr>
<tr>
<td>It is easy to use</td>
<td>20</td>
<td>32.3</td>
</tr>
<tr>
<td>It has little or no side effects</td>
<td>3</td>
<td>4.8</td>
</tr>
<tr>
<td>Is your spouse aware?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>53</td>
<td>85.5</td>
</tr>
<tr>
<td>No</td>
<td>9</td>
<td>14.5</td>
</tr>
<tr>
<td>If your spouse knows, did he support it?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>50</td>
<td>94.3</td>
</tr>
<tr>
<td>No</td>
<td>3</td>
<td>5.7</td>
</tr>
</tbody>
</table>

Table 3 above shows participant responses on the use of modern contraceptive. 77 respondents (52%) affirmed that they have previously used a method of modern contraceptive. However, only 62 respondents (41.3%) said that they are currently using it while 88 respondents (58.7%) said they are not currently using any method of modern contraceptive because they desire for children (47.7%). Method of modern contraceptive utilized by participants included condoms (41.9%), injectable (22.6%), IUCD (16.1%), tablets (14.5%), implants (3.2%) and Surgery (1.6%). Many of the respondents prefer their chosen method of contraceptive because it is effective (50%) and easy to use (32.3%). Majority of the respondents currently on modern contraceptives said that their husband is aware they are using contraceptive (85.5%) and also supports it (94.3%).

Table 4: Participant’s responses on barriers to use of Modern Contraceptives (n=150)
Table 4 above reveals barrier to use of modern contraceptive among the participants. 36 respondents (24%) strongly agreed that lack of communication between couples about sex is a barrier to use of modern contraceptive use. 44% respondents strongly disagreed that their religion imposed any barrier to the use of contraceptive. 59 (39.3%) respondents disagreed on negative attitudes of contraceptive providers as a barrier to its use. Also, 44% of the respondents strongly disagreed on the statement that their culture does not accept family planning. 65 respondents (43.3%) also strongly disagreed that using a contraceptive makes a woman promiscuous. 65 respondents (43.3%) disagreed on having a large family as a barrier to contraceptive use. 41 respondents (27.3%) agreed that fear of side effect of contraceptive is a barrier to its use. 59 respondents (39.3%) disagreed on accessibility of contraceptive within their locality as a barrier. Additionally, 54 respondents (36%) strongly disagreed on the statement that their husband does not want them to use family planning methods as a barrier to the use of modern contraceptive.

Table 5: Chi-square analysis between awareness of modern contraceptive (ever heard of) and current use of modern contraceptive

<table>
<thead>
<tr>
<th>Awareness of Modern contraceptive</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
<th>Chi-square ((\chi^2))</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>62</td>
<td>79</td>
<td>141</td>
<td>6.746</td>
<td>0.0094</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
<td>9</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>62</td>
<td>88</td>
<td>150</td>
<td>6.746</td>
<td>0.0094</td>
</tr>
</tbody>
</table>

Table 5 above revealed the result of a chi-square test measuring women’s awareness of modern contraceptive (ever heard of) and the current use of modern contraceptive. Since the calculated p-value is less than the table value at degree of freedom of 1 (p < 0.05), therefore, a statistically significant difference exist between awareness of modern contraceptive and its current use. This implies that women’s use of modern contraceptive is influenced by their level of awareness.

IV. DISCUSSION

150 mothers who were registered with and also attended child welfare clinic in the three selected health facilities participated in this study. Results obtained from this study suggest that the awareness of modern contraceptive among participants is high. Perhaps this could be due to provision of information on family planning and contraceptive usually made available to participants by their care providers during the child welfare clinic as majority of the participants (77.3%) got the information regarding modern contraceptive at various health facilities utilized. Participants viewed modern contraceptive as useful in child spacing (41.3%) and prevention of pregnancy (55.3%). Male condoms, injectable and oral pills among others were major methods identified. This finding is similar to the observation made by another study. 2

However, participants’ use of modern contraceptive is low. Although more than half of the respondents (52%) affirmed using a method of contraceptive in the past, only 41.3% respondents agreed that they are currently using it. The desire for more children was a major reason for their non-use of contraceptive. Male condom (41.9%) was identified as the method mostly utilized by the participants because it is effective to them as well as easy to use. Male condoms are always available, accessible and cheap in most retail shops within inner-cities and its cultural acceptability towards HIV prevention which reportedly increased over the years could account for its awareness and use. 2 In addition, most of the respondents currently using a method of modern contraceptive claimed their husbands are aware that they are on contraceptives (85.5%) and also gave his support (94.3%). Perceived support from husbands on choice of contraceptives associated with high usage of modern contraceptives. 11-12
Some of the barriers to contraceptive use as identified from this study included lack of communication between couples about sex and fear of side effect of modern contraceptives with the latter also reported by other studies\textsuperscript{[2, 10]} as a major hindrance to the use of modern contraceptives. There is need to educate women on these common side effects in order to improve adherence and use. However, it is interesting to note that many participants sampled in this study strongly disagreed on factors such as religion, cultural background and believe that contraceptive use makes a woman to be promiscuous as well as having a large family as prestigious, lack of husbands support, accessibility of contraceptives within their locality and negative attitudes of contraceptive providers as barriers to use of modern contraceptive. This could be related to participants’ level of education as many of them have been schooled up to diploma, graduate and post-graduate levels. In addition, inner-city women are observed to lay little or no emphasis on traditional and cultural values due to westernization.\textsuperscript{[3]}

There are implications of these findings to nursing practice. This study has revealed that participants are aware of modern contraceptives. However, its use is still low due to lack of communication among couples as regards to their sexual life and fear of side effects of modern contraceptives. Hence it is necessary for nurses to emphasize on the importance of open and effective communication among couples especially as it relates to sex and contraceptive use. This will elicit more husband support and also increase contraceptive use among women. Furthermore, nurses should endeavor to explicitly discuss the indications for use and side effects of these contraceptives with the women during the education and counselling sessions of the child welfare clinic and offer guidance on every woman’s choice of contraceptives.

V. CONCLUSION

This study assessed the awareness of modern contraceptives, its use and barriers among women. Study findings shows that many of the participants are aware of modern contraceptive; however its usage is poor. Some factors which were identified as barriers to contraceptive use among the participants are lack of communication among couples about sex and fear of side effects of modern contraceptives. Women should be encouraged to communicate effectively with their husbands. This will enhance support given by husbands and also enable them to successfully plan and control the birth of their children. Furthermore, women should be properly guided on their choice of contraceptive method in consideration to indications for use and side effects of chosen method of contraceptive. This will minimize adverse effect and thereby improve adherence to the use of chosen methods.

VI. RECOMMENDATIONS

Study has revealed that although the awareness of modern contraceptives among participants is high, however it did not translate into high usage. Based on these findings, it is therefore recommended that Healthcare providers should utilize every opportunity encountered with mothers during child welfare clinic to communicate the benefit of modern contraceptive to them. The use of mass media services especially electronic and print should still be employed in increasing awareness on the benefits of modern contraceptive. Additionally, there is need for community outreach in order to educate men on contraceptives and its benefits. Also making contraceptive services more available in the locality where people lives may also improve its access. Education of the girl child and continued empowerment of the women should be intensified in order to improve their acceptance and usage of contraceptive methods. Furthermore, religious organizations and traditional institutions should be encouraged to promote the use of contraceptive method in the community. Government should formulate policies that limit the number of children each family should have in order to improve the use of contraceptives. In the future, there is need for qualitative studies to be carried out on the experiences of women using modern contraceptives. Such studies may help to reduce women’s fear of side effects of modern contraceptive. Also further studies should examine the role which husband’s support could play on women’s utilization of modern contraceptive as this may increase its use.

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To all the women who participated in the course of this study, we say many thanks to you for your time.

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Numerical Solutions of Second Order Initial Value Problems of Bratu-Type equation Using Higher Ordered Rungu-Kutta Method

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Department of Mathematics, Jimma University, Ethiopia

Abstract
This paper presents the fifth order Runge-Kutta method (RK5) to find the numerical solution of the second order initial value problems of Bratu-type ordinary differential equations. In order to justify the validity and effectiveness of the method, we solve three model examples and compare the exact solutions to numerical solutions. The numerical results in terms of point wise absolute errors presented in tables and the plotted graphs show that the present method approximates the exact solution very well. Besides, the stability of the method had been checked and verified.

Index Terms: Initial-Value Problem; Bratu-type Equation; Numerical Solution; Runge-Kutta method

I. INTRODUCTION

Many problems in science and engineering can be formulated in terms of differential equations. A differential equation is an equation involving a relation between an unknown function and one or more of its derivatives. Equations involving derivatives of only one independent variable are called ordinary differential equations and may be classified as either initial-value problems (IVP) or boundary-value problems (BVP). Many authors have attempted to solve initial value problems (IVP) to obtain high accuracy rapidly by using numerous methods, such as Taylor’s method, Runge-Kutta method, and also some other methods. A more robust and intricate numerical technique is the Runge Kutta method. This method is the most widely used one since it gives reliable starting values and is particularly suitable when the computation of higher derivatives is complicated.

On the other hand, according to Abukhaled, M. et al. (2012) the standard Bratu problem is used in a large variety of applications, such as the fuel ignition model of the theory of thermal combustion, the thermal reaction process model, the Chandrasekhar model of the expansion of the universe, radiative heat transfer, nanotechnology and theory of chemical reaction.

The Bratu initial value problems have been studied extensively because of its mathematical and physical properties. Batiha, B (2010) studied a numerical solution of Bratu-type equations by the variational iteration method; Feng et al. (2008) considered Bratu’s problems by means of modified homotopy perturbation method; Rashidinia, J. et al. (2013) applied Sinc-Galerkin method for numerical solution of the Bratu’s problems; Syam and Hamdan (2006) used variational iteration method for numerical solutions of the Bratu-type problems; Wazwaz, A (2005) applied Adomian decomposition method to study the Bratu-type equations. L. Jin (2010) applied modified...
variational iteration method to Bratu-type problems. Ji-Huan He, et al. (2014) considered variational iteration method for Bratu-like equations arising in electrospinning. Saravi, M. et al. (2013) studied solution of Bratu’s equation by He’s variation iteration method. Motivated by the above investigations, the objective of the present study is to investigate numerical solutions of second order initial value problems of Bratu-type equation using higher ordered Runge-kutta method (RK5).

II. FORMULATION OF THE METHOD

Consider the second order initial value problem of Bratu-Type equation of the form:

\[ y''(x) + \lambda e^{y(x)} = g(x), \quad 0 < x \leq l \]

Subject to the initial conditions

\[ y(0) = \alpha, \quad y'(0) = \beta \]

where \( \lambda, \alpha \) and \( \beta \) are given constant numbers for \( y(x) \) is unknown function.

To reduce the order of Eqn. (1), let we use the substitutions \( z(x) = y'(x) \) and \( z'(x) = y''(x) \), so that the given second order initial value problem of Eqn. (1) with Eqn. (2) can be re-written as:

\[
\begin{align*}
  y'(x) &= z(x) = F(x, y, z), \quad y(0) = \alpha \\
  z'(x) &= g(x) - \lambda e^{y(x)} = G(x, y, z), \quad z(0) = y'(0) = \beta 
\end{align*}
\]

Dividing the interval \([0, l]\) into \( N \) equal subinterval of mesh length \( h \) and the mesh point is given by \( x_i = x_0 + ih, \) for \( i = 1, 2, ..., N - 1. \) For the sake of simplicity let use the denotation: \( y(x_i) = y_i, \)
\( z(x_i) = z_i, \) \( g(x_i) = g_i, \) etc. Thus, at the nodal point \( x_i \) Eqn. (3), is written as:

\[
\begin{align*}
  y'_i &= F(x_i, y_i, z_i), \quad y(0) = \alpha \\
  z'_i &= G(x_i, y_i, z_i), \quad z(0) = \beta
\end{align*}
\]

where \( G(x_i, y_i, z_i) = g_i - \lambda e^{y(x)} \)

To solve each initial value problems written in Eqn. (4), we apply the single step methods that require information about the solution at \( x_i \) to calculate at \( x_{i+1}, \) (Grewal, 2002), (Jain et al, 2007). From one of the single step methods and the family of Runge Kutta methods, the general numerical solution of Eqn. (4) using the fifth Runge Kutta method given as:
\[
\begin{align*}
\dot{y}_{i+1} &= y_i + \sum_{i=1}^{5} w_i k_i \\
\dot{z}_{i+1} &= z_i + \sum_{i=1}^{5} w_i k_i \\
\end{align*}
\]

where
\[
\begin{align*}
k_i &= hF(x_i + c_i h, y_i + \sum_{j=1}^{4} a_{ij} k_j, z_i + \sum_{j=1}^{4} a_{ij} m_j) \\
m_i &= hG(x_i + c_i h, y_i + \sum_{j=1}^{4} a_{ij} k_j, z_i + \sum_{j=1}^{4} a_{ij} m_j)
\end{align*}
\]

Christodoulou (2009), was present the fifth order Runge Kutta method to solve a first order initial value problem of the form \( \frac{dy}{dt} = f(t, y) \), \( y(t_0) = y_0 \), which is given by the following equation:

\[
y_{n+1} = y_n + \frac{7k_1 + 32k_3 + 12k_4 + 32k_5 + 7k_6}{90}
\]

where
\[
\begin{align*}
k_1 &= hf(x_n, y_n) \\
k_2 &= f(t_n + \frac{h}{2}, y_n + \frac{k_1}{2}) \\
k_3 &= f(t_n + \frac{h}{4}, y_n + \frac{3k_1 + k_2}{16}) \\
k_4 &= f(t_n + \frac{3h}{4}, y_n + \frac{-3k_2 + 6k_3 + 9k_4}{16}) \\
k_5 &= f(t_n + h, y_n + \frac{k_1 + 4k_2 + 6k_3 - 12k_4 + 8k_5}{7}) \\
k_6 &= f(t_n + h, y_n + \frac{k_1}{2}) \\
\end{align*}
\]

Thus, to solve the system of initial value problem of Eqn. (3), the fifth order Runge Kutta method can be re-written as:

\[
\begin{align*}
\dot{y}_{i+1} &= y_i + \frac{7k_1 + 32k_3 + 12k_4 + 32k_5 + 7k_6}{90} \\
\dot{z}_{i+1} &= z_i + \frac{7m_1 + 32m_3 + 12m_4 + 32m_5 + 7m_6}{90}
\end{align*}
\]

where: \( k_i = F(x_i, y_i, z_i) \), \( m_i = G(x_i, y_i, z_i) \),

\[
\begin{align*}
k_2 &= hF(x_i + \frac{h}{2}, y_i + \frac{k_1}{2}, z_i + \frac{m_1}{2}) \\
m_2 &= hG(x_i + \frac{h}{2}, y_i + \frac{k_1}{2}, z_i + \frac{m_1}{2}) \\
k_3 &= hF(x_i + \frac{3k_1 + k_2}{16}, z_i + \frac{3m_1 + m_2}{16}) \\
m_3 &= hG(x_i + \frac{3k_1 + k_2}{16}, z_i + \frac{3m_1 + m_2}{16})
\end{align*}
\]
In the determination of the parameters, since the terms are up to \( O(h^5) \) be compared, the truncation error is \( O(h^6) \) and the order of method is \( O(h^5) \). (Grewal, 2002) and (Jain et al, 2007).

III. STABILITY ANALYSIS

Here, the second order initial value problem Bratu-Type equation of the form of Eqn. (1) is reduced into first order system of equations of the form of Eqn. (4) and let take the second equation from Eqn. (4), then we have:

\[ z'_i = G(x, y, z), \quad z(0) = \beta \tag{8} \]

where \( G(x, y, z) = g_i - \lambda e^{\gamma_i} \)

The nonlinear function Eqn. (8) can be linearized by expanding the function \( G \) in Taylor series about the point \((x_0, y_0, z_0)\) and truncating it after the first term as:

\[ z' = G(x_0, y_0, z_0) + (x - x_0) \frac{\partial G}{\partial x}(x_0, y_0, z_0) + (y - y_0) \frac{\partial G}{\partial y}(x_0, y_0, z_0) \\
+ (z - z_0) \frac{\partial G}{\partial z}(x_0, y_0, z_0) \tag{9} \]

By the differentiation rules of function of several variables Eqn. (9) can be written as:
\[ z' = g_0 - \lambda e^{y_0} + (x - x_0)(g_0' - \lambda y_0 e^{y_0}) + \lambda (y_0 - y) e^{y_0} \]
\[ = C \] (10)

where \[ C = g_0 - \lambda e^{y_0} + (x - x_0)(g_0' - \lambda y_0 e^{y_0}) + \lambda (y_0 - y) e^{y_0} \]

\[ \Rightarrow z' = C, \] which is linear in the function of \( z \).

Let the test function is \( y' = \lambda y \) (11)

which is called the linear test equation for the non-linear Eq. (8). The solution of the test equation, Eqn. (11) is:

\[ y_n = y(x_n) = y(x_0) e^{\lambda h} = y_0 (e^{\lambda h})^n \] (12)

where \( y_0 \) is constant.

Now, by applying Eqn. (6) on Eqn. (12), we have:

\[ m_1 = \lambda h y_i, \quad m_2 = \lambda h y_i (1 + \frac{1}{2} \lambda h), \quad m_3 = h \lambda y_i + \frac{h^2 \lambda^2}{4} y_i + \frac{h^3 \lambda^3}{32} y_i \]

\[ m_4 = \lambda h y_i (1 + \frac{\lambda h}{2} + \frac{h^2 \lambda^2}{8} + \frac{h^3 \lambda^3}{64}) \]

\[ m_5 = \lambda h y_i + \frac{3}{4} \lambda^2 h^2 y_i + \frac{9}{32} \lambda^3 h^3 y_i + \frac{21}{256} h^4 \lambda^4 y_i + \frac{9}{1024} \lambda^5 h^5 y_i \]

\[ m_6 = \lambda h y_i + \lambda^2 h^2 y_i + \frac{1}{2} \lambda^3 h^3 y_i + \frac{15}{112} h^4 \lambda^4 y_i + \frac{15}{224} h^5 \lambda^5 y_i + \frac{9}{896} \lambda^6 h^6 y_i \]

By substituting the values of \( m_1 \) and \( m_3 - m_6 \) into \( y_{i+1} = y_i + \frac{7m_1 + 32m_3 + 12m_4 + 32m_5 + 7m_6}{90} \), we obtain:

\[ y_{i+1} = (1 + \lambda h + \frac{1}{2} \lambda^2 h^2 + \frac{1}{6} \lambda^3 h^3 + \frac{1}{24} \lambda^4 h^4 + \frac{1}{120} \lambda^5 h^5 + \frac{1}{1280} \lambda^6 h^6) y_i \]

\[ y_{i+1} = E(\lambda h) y_i \] (13)
where: \[ E(\lambda h) = 1 + \lambda h + \frac{1}{2} \lambda^2 h^2 + \frac{1}{6} \lambda^3 h^3 + \frac{1}{24} \lambda^4 h^4 + \frac{1}{120} \lambda^5 h^5 + \frac{1}{1280} \lambda^6 h^6 \]

The errors in numerical computation don’t grow, if the propagation error tends to zero or if at least bounded, (Jain et al, 2007). Now, from Eqn. (12), it is easily observed, the exact value of \( y(x_j) \) increases for the constant \( \lambda > 0 \) and decreases for \( \lambda < 0 \) with the factor of \( e^{\lambda h} \). While from Eqn. (12) the approximate value of \( y_j \) increases or decreases with the factor of \( E(\lambda h) \). If \( \lambda h > 0 \), then \( e^{\lambda h} \geq 1 \); so the fifth order Runge Kutta method is relatively stable. If \( \lambda h < 0 \), (i.e., \( \lambda < 0 \)) then the fifth order Runge Kutta method is absolutely stable in the interval of \(-5.604 < \lambda h < 0\).

IV. NUMERICAL EXAMPLES AND RESULTS

As discussed above, we are implementing the fifth order Runge Kutta method on three model example of the second order initial value problems of Bratu’s-type equation as follows:

**Example 1**: Consider the Bratu-type initial value problem

\[ y'' - 2e^y = 0; \quad 0 < x < 1 \]

\[ y(0) = 0, \quad y'(0) = 0 \]

whose exact solution is \( y(x) = -2 \ln(\cos(x)) \)

<p>| Table 1. Comparison of absolute errors for example 1 |
|-----------------|-----------------|-----------------|-----------------|-----------------|</p>
<table>
<thead>
<tr>
<th>( x )</th>
<th>Darwish and Kashkari, 2014</th>
<th>Eslam Moradi, 2015</th>
<th>Sinan and Necdet, 2016</th>
<th>Our Method (RK5)</th>
<th>Our Method (RK5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>6.41021065e-7</td>
<td>1.6674e-5</td>
<td>9.4728e-6</td>
<td>4.9027e-9</td>
<td>4.8904e-015</td>
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<td>0.2</td>
<td>9.74693876e-6</td>
<td>3.1000e-7</td>
<td>3.3152e-5</td>
<td>1.0071e-8</td>
<td>9.7697e-015</td>
</tr>
<tr>
<td>0.3</td>
<td>4.52998213e-5</td>
<td>1.1310e-6</td>
<td>2.7254e-5</td>
<td>1.5973e-8</td>
<td>1.4542e-014</td>
</tr>
<tr>
<td>0.4</td>
<td>1.27118347e-4</td>
<td>21200e-6</td>
<td>4.4563e-6</td>
<td>2.3233e-8</td>
<td>1.9526e-014</td>
</tr>
<tr>
<td>0.5</td>
<td>2.68671650e-4</td>
<td>2.9000e-6</td>
<td>5.5511e-8</td>
<td>3.2789e-8</td>
<td>2.4300e-014</td>
</tr>
<tr>
<td>0.6</td>
<td>4.83656903e-4</td>
<td>4.1000e-6</td>
<td>7.2047e-5</td>
<td>4.6204e-8</td>
<td>2.9238e-014</td>
</tr>
<tr>
<td>0.7</td>
<td>8.36799541e-4</td>
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<td>3.9077e-014</td>
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<tr>
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<td>1.5718e-7</td>
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<td>4.4409e-8</td>
<td>2.7544e-7</td>
<td>4.9098e-014</td>
</tr>
</tbody>
</table>
Figure 1: Plot of exact and approximated solutions of Biratu type- Equation using RK5 for $h = 0.1$

Figure 2: Plot of exact and approximated solution of Biratu type- Equation using RK5 for $h = 0.1$
**Example 2:** Consider the Bratu-type initial value problem

\[
\frac{d^2 y}{dx^2} = -\pi^2 e^{-y}; \quad y(0) = 0, \quad y'(0) = \pi
\]

Whose exact solution is \( y(x) = \ln(1 + \sin(\pi x)) \)

**Table 2:** Comparison of absolute errors, for example 2

<table>
<thead>
<tr>
<th>( x )</th>
<th>( Eslam \text{ Moradi, 2015} )</th>
<th>Our Method (RK5)</th>
<th>Our Method (RK5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>3.20777e-4</td>
<td>8.3507e-008</td>
<td>2.2668e-013</td>
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<tr>
<td>0.2</td>
<td>2.37600e-5</td>
<td>4.4458e-008</td>
<td>4.1313e-013</td>
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<tr>
<td>0.3</td>
<td>3.58700e-5</td>
<td>2.6380e-007</td>
<td>5.6410e-013</td>
</tr>
<tr>
<td>0.4</td>
<td>8.01000e-5</td>
<td>5.3872e-007</td>
<td>6.8325e-013</td>
</tr>
<tr>
<td>0.5</td>
<td>1.19500e-4</td>
<td>8.6014e-007</td>
<td>7.7396e-013</td>
</tr>
<tr>
<td>0.6</td>
<td>1.66200e-4</td>
<td>1.2299e-006</td>
<td>8.3944e-013</td>
</tr>
<tr>
<td>0.7</td>
<td>2.20200e-4</td>
<td>1.6559e-006</td>
<td>8.8199e-013</td>
</tr>
<tr>
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<td>9.0730e-013</td>
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<tr>
<td>1.0</td>
<td>5.37400e-4</td>
<td>3.3454e-006</td>
<td>8.9412e-013</td>
</tr>
</tbody>
</table>

**Figure 3:** Plot of exact and approximated solutions of Biratu type- Equation using RK5 for \( h = 0.1 \)
Figure 4: Plot of exact and approximated solution of Biratu type- Equation using RK5 for \( h = 0.01 \)

**Example 3:** Consider the Bratu-type initial value problem

\[
y'' - e^{2y} = 0; \quad 0 < x < 1
\]

\[
y(0) = 0, \quad y'(0) = 0
\]

whose exact solution is \( y(x) = \ln(\sec(x)) \):

**Table 3:** Comparison of absolute errors, for example 3

<table>
<thead>
<tr>
<th>( x )</th>
<th>Absolute errors at ( h = 0.1 )</th>
<th>( h = 0.01 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( x )</td>
<td><em>Eslam Moradi, 2015</em></td>
<td>Our Method (RK5)</td>
</tr>
<tr>
<td>0.1</td>
<td>8.3330e-6</td>
<td>2.4514e-009</td>
</tr>
<tr>
<td>0.2</td>
<td>6.4000e-7</td>
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<tr>
<td>1.0</td>
<td>2.1400e-5</td>
<td>1.3772e-007</td>
</tr>
</tbody>
</table>
Figure 5: Plot of exact and approximated solutions of Biratu type- Equation using RK5 for $h = 0.1$

Figure 6: Plot of exact and approximated solution by Biratu type- Equation using RK for $h = 0.01$
V. DISCUSSION AND CONCLUSION

In this paper we presented higher order Rang – Kutta (RK5) method to investigate numerical solutions of second order initial value problems of Bratu-type equation. To further justify the applicability of the proposed method; tables of point wise absolute errors and graphs have been plotted for the three model examples to compare the exact solutions and numerical solutions at different mesh size $h$. Tables 1, 2 and 3 depicted that the fifth order Rung – Kutta method improves the findings of (Darwish and Kashkari, 2014), (Eslam Moradi, 2015), (Sinan and Necdet, 2016). Moreover, it is evident that all the absolute errors decrease rapidly as the mesh size $h$ decreases, which in turn shows that the smaller mesh size provides the better approximate value. Figures (1 – 6) show that the present method approximates the exact solution in an excellent manner.

VI. REFERENCES


VII. AUTHORS

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Undergraduate students Knowledge on AIDS/HIV and It’s associated factors in Eastern University, Sri Lanka

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jeshikarthi@gmail.com

Abstract - Acquired immune deficiency syndrome (AIDS) has a great impact on society, both as an illness and as a source of discrimination. Numerous social and behavioral factors are involved in the spread of HIV/AIDS such as prostitution, broken homes, sexual disharmony, easy money, emotional immaturity, urbanization and industrialization, changing behavioral patterns, social stigma and alcoholism. Most of the infected people are not aware about their HIV status. Social stigma and discrimination towards HIV infected people adversely affect voluntary testing for HIV. Lack of information about the causes and risk factors of AIDS can place a large number of young people at the risk of acquiring Human Immunodeficiency Virus infection (HIV). Therefore, knowledge regarding AIDS is an essential precursor of sexual risk reduction. The aim of the study was to assess the influence of socio demographic and educational related factors in the knowledge of HIV/AIDS among first year students of the Eastern University, Sri Lanka. This was a descriptive cross-sectional study carried out among 300 first year students of the Eastern University. Stratified random sampling method was used to select sample. Self-administered questionnaire was used to collect data. Among the 300 participants, 36.3% were male and 63.7% were female. 46.7% of them were Tamil, 30%, 20.7% and 2.7% were Sinhalese, Muslims and Burgers respectively. The mean knowledge score regarding HIV/AIDS among first year students of the Eastern University was 43.7%. Female students had higher knowledge than male students. Health care students had higher knowledge than other faculties’ students. All male and female participants were aware that AIDS is a sexually transmitted disease. There was a significant association between mean knowledge scores of HIV/AIDS and gender, ethnicity, faculty, stream of A/L study, and source of information obtained (p <0.05). The knowledge regarding AIDS was average among majority of first year students of the Eastern University. Knowledge about transmission methods, signs and symptoms and preventive measures of AIDS was good among all students except in some response.

Index Terms - AIDS, Factors, Knowledge, Transmission methods, Preventive methods

I. INTRODUCTION

Acquired immune deficiency syndrome (AIDS) has a great impact on society, both as an illness and as a source of discrimination (Kumar & Clark, 2009). It has become a pandemic disease and threatens the world population. It affects all body systems as well as mental health and social relationship of carriers and asymptomatic patients. Numerous social and behavioral factors are involved in the spread of HIV/AIDS such as prostitution, broken homes, emotional immaturity, and industrialization, changing behavioral patterns, social stigma and alcoholism (Park, 2003). At the end of year 2015, total 36.7 million people living with HIV in the world. Of these 2.1 million are newly infected in 2015. In 2015 nearly 1.1 million AIDS related deaths occur in worldwide (UNAIDS, 2016). The first case of HIV and AIDS in Sri Lanka was reported in 1987 and in 2015 the total number of cumulative cases reported had increased to 2308. In 2015, 235 new HIV cases reported to the national STD/AIDS control programme in Sri Lanka. This is the highest number reported in a year and this amounts to about 4.5 new HIV cases per week. Majority of the patient are age between 25-34 and 35-49. The number of cases reported in the age category 15-24 has been increased recently. Most of the infected people are not aware about their HIV status. Social stigma and discrimination towards HIV infected people adversely affect voluntary testing for HIV. Sexual transmission accounted for 86% of all cases reported during 2015 (Ministry of Health, 2015). Lack of information about the causes and risk factors of AIDS can place a large number of young people at the risk of acquiring Human Immunodeficiency Virus infection (HIV) (UNAIDS, 2010). Therefore, knowledge regarding HIV/AIDS is an essential precursor of sexual risk reduction. The aim of the study was to assess the influence of socio demographic and educational related factors in the knowledge of HIV/AIDS among first year students of the Eastern University, Sri Lanka. In this study the common knowledge about HIV/AIDS transmission, signs and symptoms and preventive methods had been evaluated among first year students of Eastern University, Sri Lanka.
II. METHODOLOGY

This was a descriptive cross sectional study carried out to assess the influence of socio demographic and educational related factors in the knowledge of HIV/AIDS among 300 first year students of the Eastern University, Sri Lanka. The students selected from six faculties for this study. The first year students selected for this study because they were just passed their advanced level and entered to the university systems. Therefore they have lack of chance to socialize with other university students to obtain knowledge about HIV/AIDS and had less exposure to academic activities such as lectures and workshop regarding HIV/AIDS and this age group is more sexually active group also. Stratified random sampling method was used to select sample. Data were collected from students those who was willing to participate in the study. Respondents, who were not present at the time of study; who refused to participate in this study were excluded from the study. The respondents were thoroughly explained about the study and verbal informed consent was obtained before the data collection. The ethical clearance was obtained from the ethical review committee Faculty of Health Care sciences, Eastern University, Sri Lanka. The written permission was obtained from the Head of the institution. Anonymity was ensured throughout the study. Data were collected by investigators through a structured self-administered questionnaire. The pretest was carried out among 15 students to validate the questionnaire for accountability and accuracy. These students were excluded from this study. The questionnaire was modified based on finding of the pretest with the help of the experienced clinicians and health academics. The study instrument initially was developed in English. Then it translated to Tamil and Sinhala. The questionnaire was distributed for the students in their own language as Tamil and Sinhala. The original questionnaire contained 15 questions including demographic information, Sources of information and disease knowledge including mode of transmission, signs and symptoms and preventive methods. The knowledge questions were answered using “Yes”, “No” and “Do Not No”. A total score for knowledge was obtained by adding the points for given each answer. For each correct answer 01 points, incorrect answer zero points were assigned. The total score were ranged between 0-20. Then it converted into 100 percentages. Collected data were transferred to Statistical package for social sciences (SPSS) version 16 and analyzed based on the research problem, objectives and variables. The Chi-squared test and cross tabulation were performed to analyze the data. P-value for statistical significant was set to 0.05.

III. RESULTS AND FINDINGS

Table 1: Socio-demographic data of participants

<table>
<thead>
<tr>
<th>Variables (n=300)</th>
<th>Number</th>
<th>Percentage (100%)</th>
</tr>
</thead>
<tbody>
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<td></td>
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<td>Christian</td>
<td>24</td>
<td>8.0</td>
</tr>
<tr>
<td>Faculty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FHCS</td>
<td>22</td>
<td>7.3</td>
</tr>
<tr>
<td>Science</td>
<td>70</td>
<td>23.3</td>
</tr>
<tr>
<td>Agriculture</td>
<td>20</td>
<td>6.7</td>
</tr>
<tr>
<td>Commerce &amp; Management</td>
<td>54</td>
<td>18.0</td>
</tr>
<tr>
<td>Arts &amp; Culture</td>
<td>72</td>
<td>24.0</td>
</tr>
<tr>
<td>SVIAS</td>
<td>62</td>
<td>20.7</td>
</tr>
<tr>
<td>Source of information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Books</td>
<td>219</td>
<td>73.0</td>
</tr>
<tr>
<td>Newspaper</td>
<td>228</td>
<td>76.0</td>
</tr>
<tr>
<td>Television</td>
<td>192</td>
<td>64.0</td>
</tr>
<tr>
<td>Health related poster</td>
<td>183</td>
<td>61.0</td>
</tr>
</tbody>
</table>

Among the 300 participants, 36.3 % were male and 63.7 % were female. 46.7 % of them were Tamil, 30 %, 20.7% and 2.7% were Sinhalese, Muslims and Burgers respectively. Majority of the students were Hindu. The sources of information books, newspaper and television 73%, 76% and 64% were respectively. Table 1 gives the percentage distribution of participants’ socio demographic characteristics.

www.ijsrp.org
Table 2: Knowledge about mode of transmission, Signs & symptoms and prevention of HIV/AIDS

<table>
<thead>
<tr>
<th>Variables (n=300)</th>
<th>Yes (%)</th>
<th>No (%)</th>
<th>Don’t know (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transmission</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex with infected person</td>
<td>83.1</td>
<td>4.3</td>
<td>12.5</td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>74.4</td>
<td>8.4</td>
<td>17.2</td>
</tr>
<tr>
<td>Mother to child</td>
<td>71.1</td>
<td>7.1</td>
<td>21.2</td>
</tr>
<tr>
<td>Mosquito bites</td>
<td>19.9</td>
<td>49.8</td>
<td>30.3</td>
</tr>
<tr>
<td>Kissing</td>
<td>23.1</td>
<td>53.8</td>
<td>23.1</td>
</tr>
<tr>
<td>Breast feeding</td>
<td>53.8</td>
<td>7.7</td>
<td>38.5</td>
</tr>
<tr>
<td><strong>Signs &amp; Symptoms</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purulent discharge from genitalia</td>
<td>83.0</td>
<td>10.7</td>
<td>6.3</td>
</tr>
<tr>
<td>Burning sensation during urination</td>
<td>51.4</td>
<td>24.1</td>
<td>24.5</td>
</tr>
<tr>
<td>Redness in genitalia</td>
<td>66.7</td>
<td>12.3</td>
<td>21.0</td>
</tr>
<tr>
<td>Swelling of genitalia</td>
<td>68.3</td>
<td>15.2</td>
<td>16.5</td>
</tr>
<tr>
<td>Ulcers in genitalia</td>
<td>70.4</td>
<td>11.3</td>
<td>18.3</td>
</tr>
<tr>
<td>Sub fertility</td>
<td>31.2</td>
<td>35.8</td>
<td>33.0</td>
</tr>
<tr>
<td><strong>Preventive methods</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avoid sex with</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Sexual workers</td>
<td>69.7</td>
<td>7.6</td>
<td>22.7</td>
</tr>
<tr>
<td>-Multiple partners</td>
<td>80.6</td>
<td>6.0</td>
<td>13.4</td>
</tr>
<tr>
<td>Avoid Homosexual</td>
<td>46.3</td>
<td>18.4</td>
<td>35.3</td>
</tr>
<tr>
<td>Using condom</td>
<td>73.1</td>
<td>6.0</td>
<td>20.9</td>
</tr>
<tr>
<td>Avoid kissing</td>
<td>20.5</td>
<td>38.6</td>
<td>40.9</td>
</tr>
<tr>
<td>Using antibiotics</td>
<td>30.2</td>
<td>34.4</td>
<td>35.4</td>
</tr>
<tr>
<td>before sex</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All male and female participants were aware that AIDS is a sexually transmitted disease. Most of the participants were aware of sex with infected person (83.1%), blood transfusion (74.4%) and mother to child through placenta (71.1%) as the mode of HIV/AIDS transmission. Majority of the participants were aware purulent discharge from genitalia (83%), Redness in genitalia (66.7%) and ulcers in genitalia (70.4%) as the signs and symptoms of HIV/AIDS. Most of the participants were aware of preventive methods of HIV/AIDS such as avoid sex with sexual workers (69.7%), using condom (73.1%). Nearly half of the participants were aware avoid homosexual as preventive method. Table 2 gives the detail response of participants about mode of transmission, Signs & symptoms and prevention of HIV/AIDS.
The mean knowledge score regarding AIDS among first year students of the Eastern University was 43.7%. Mean percentages of HIV/AIDS knowledge score were in different faculties as follow: Arts (43.4), Science (51.2), Commerce (48.7), Agriculture (53.4), Faculty of Health-Care Sciences (FHCS) (64.7) and Swami Vipulananda Institute of Aesthetic Studies (SVIAS) (35.3). FHCS students had more knowledge than other faculties’ students. Figure 1 shows the mean HIV/AIDS knowledge in different faculties.

<table>
<thead>
<tr>
<th>Significant variables</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>0.007</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>0.004</td>
</tr>
<tr>
<td>Faculty</td>
<td>0.027</td>
</tr>
<tr>
<td>Stream of A/L study</td>
<td>0.049</td>
</tr>
<tr>
<td>Source of information</td>
<td>0.037</td>
</tr>
</tbody>
</table>

There was a significant association between mean knowledge scores of AIDS and gender, ethnicity, faculty, stream of A/L study, and source of information obtained (p <0.05).

IV. DISCUSSION

The present study evaluated the socio-demographic factors influence on knowledge of HIV/AIDS among first year Eastern University students. The increasing number of reported HIV/AIDS positive cases in Sri Lanka became a major health issue and negatively affects the public health. This emerging spread push to the students to learn more about HIV/AIDS. The Americans and Europeans investigators also found that students are more interesting to know about HIV/AIDS when AIDS epidemics was occur before one decade ago (Herlitz & Brorsson, 1990; Rich, Holmes, & Hodges, 1996; Gallup Organization, 1988). In this study all the students aware that HIV/AIDS is a sexually transmitted disease and threat to the society but some considerable proportion of the students answered HIV/AIDS is curable disease and consistent with Agrawal et al. (1999) study and can be attributed to the many false claims published in media and other modes of advertisements. Misinformation concerning a “cure” for AIDS is one of the risk factors for contracting the disease. The present study revealed that means knowledge score regarding HIV/AIDS was average but Nasir et al. (2008) study claimed that moderate to good overall knowledge. This study found that female students had more knowledge than male students; the difference is small, similar reports from Tavoosi et al. (2004), Brook (1999) and Green (1991). However Agrawal et al. (1999) found that boys had better knowledge than female students and their explanation for this finding was that boys feel free than girls to talk about matters relating to sex and HIV/AIDS. The media is the important source to obtain the knowledge regarding the disease but the information should be accurate and easily understandable by all level public. It was noticed that books (73%) and newspaper (76%) played major role as the sources of information about AIDS. In addition many of them gathered knowledge by watching television (64%). In a similar study they found that the main sources of knowledge were lectures (61%), media (44%), and health care workers (39%) (Nasir et al, 2008). According to the data from this study most of the students were aware of transmission methods of AIDS such as “Sex with infected person” (83.1%), “Blood transfusion” (74.4%), “From mother to child” (71.1%), Majority of them answered as “Yes”. But they were not aware about “homosexual” (30.3%). In a similar study was found that “Blood transfusion” (96.1%), “contaminated sharp instruments (93.9%) were the transmission method for HIV/AIDS (Nasir et al, 2008). In this study the preventive methods of HIV/AIDS were “abstain from sex” (69.7%), “usage of condom during intercourse” (73.1%) and
“having sex with one partner” (80.6%). In a similar study found that nearly half of adolescents were aware that using condoms could minimize the risk of contracting HIV/AIDS (Nasir et al, 2008). In general, awareness on preventive mechanisms increased with age. More boys than girls aware of these methods overall knowledge on preventive methods improved with rising socio economic status.

V. CONCLUSION AND RECOMMENDATION

The knowledge regarding HIV/AIDS was average among majority of first year students of the Eastern University but need improvement in some aspects especially some transmission methods of AIDS such as homosexual. The students should be instructed all the aspect of AIDS by media. Most of the student knew common symptoms of AIDS and preventive methods but they are lack knowledge in some specific areas. The students who studied science stream in their advanced level they had better knowledge than other streams because they learned some knowledge about AIDS. There are considerable rationales to include HIV/AIDS education as an integral part of the school curriculum as well as university curriculum (Krasnik&Wangel, 1990; DiClemente, 1993; Holtzman et al,1994). Health education programs have to be done for students regarding the primary prevention and consequences of AIDS, especially students who are studying at faculty of arts, SVIAS and commerce by physicians, Nurses and Educational advisors.

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Evaluation of Surface Dose to the Thyroid Region of Pediatric Patients Undergoing Antero-Posterior Chest X-ray Examination

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** Department of Neurosurgery, National Hospital-Colombo

Abstract- Ionizing radiation used in medical imaging has probability to establish carcinogenesis and it is important to measure the radiation doses to critical organs of known sensitivity to the stochastic effects. Due to the small size of pediatrics’ body, the chest X-ray examinations are associated with high radiation exposure of non-relevant adjacent organs such as the thyroid gland. Since the thyroid cancer, particularly in pediatrics has been well established and the increasing risk of thyroid cancer from low levels of medical diagnostic X-rays has been highlighted, we aimed to measure the surface dose to the thyroid gland of pediatrics undergoing antero-posterior (AP) chest examination. After assessing each patient against specific inclusion-exclusion criteria, 100 pediatric patients who underwent AP chest X-ray examination were considered eligible for this study. The surface dose to thyroid gland was measured for each patient using high sensitive electronic pocket dosimeter (EPD) (PMD 117) and mean surface dose of all patients was calculated. The overall mean surface dose at the thyroid gland level during chest examination was 0.0127±0.0081 mGy (ranged from 0.00359 to 0.057 mGy). Since the national diagnostic reference level (DRL) is unknown, there is no possibility to compare the current results with DRL. When we compare the current results with a similar study done in Iran using thermo luminescent dosimeters (TLD), it was realized that the mean dose value of our study is lower than that published value of 0.065±0.053 mGy. Due to lack of national DRLs for X-ray imaging and published national report on the thyroid surface dose in X-ray imaging, it is impossible to say the current dose values are acceptable or not. However, we hope this study will play a small role in setting DRL for paediatric chest X-ray imaging in SriLanka with the help of further studies.

Index Terms- Antero-posterior, Chest X-ray, Pediatric patients, Surface dose, Thyroid region

I. INTRODUCTION

In developed countries several dose surveys in diagnostic radiology have been done while in developing countries such information is still lack. Since the medical exposure is the most important source of public exposure and ionizing radiations used in medical imaging has probability to establish carcinogenesis, measuring the dose received by the patients is widely considered as an important quality control tool in medical radiology [1], [2], [3].

According to Karami et al. [1] the pediatrics are sensitive to radiation carcinogenesis about ten times compared to the adults.

Since the chest radiography is the most common X-ray examination of all X-ray examinations [4], it is consider that pediatric chest X-rays highly contribute to the radiation exposure to the thyroid gland [1], [5].

Ron et al. [6] say the thyroid gland in children has one of the highest risk coefficients of any organ. Since the pediatrics’ body are small in size and pediatrics’ chest radiographs are routinely performed in anterior-posterior (AP) view instead of posterior-anterior (PA) view, radiation exposure of non-relevant adjacent organs such as the thyroid gland is high [5]. According to the Department of Pathology, University of Pittsburgh, after the Chernobyl nuclear accident in April 1986, there was an increased incidence of thyroid cancer in the exposed children remains well-documented and long-term [6].

In the countries which have advanced medical systems, guidelines for medical exposures have been set since many years ago and are clinically applied now [7]. In Sri Lanka, as many other developing countries, there is no guideline for medical exposures. To the best of our knowledge, there is no evidence for the study that evaluated the radiation exposure to the thyroid gland in pediatric chest X-rays in Sri Lanka.

The main purpose of this study was to measure the surface dose to the thyroid region for pediatric chest radiography and compare the mean surface dose value with the previous studies in order to help in optimizing the chest radiography. We hope that similar nationwide studies are performed and the radiation exposure of the patients set under the levels proposed by the international authorities.
II. MATERIALS AND METHOD

A. Sample
After assessing each patient against specific inclusion-exclusion criteria, 100 pediatric patients who were undergoing anterior-posterior (AP) projection of the chest X-ray were selected. Patients were considered eligible for inclusion if their ages were 12 years or younger, could cooperate to the requirements of the study and their parents gave informed consent. Other patients that did not meet our inclusion criteria were omitted from the study. Hundred pediatric patients with chest radiography were considered eligible and the standard supine AP projections were obtained.

B. Ethical Considerations
The ethical review committee of General Sir John Kotelawala Defense University approved the study protocol (grant No. RP/S/2016/11). The written consent was obtained from the parents before the study.

C. Data Acquisition
According to the international guidelines [8], the exposure field size should cranially be limited to the lower cervical area and caudally to the lower abdominal area at the level of T12/L1 vertebrae with maximum variation tolerance of 2 cm in each side.

The surface dose to thyroid region was measured for each patient using high sensitive electronic pocket dosimeter (EPD) (PMD 117) with a digital display manufactured by Hitachi Aloka Medical, Ltd., Tokyo, Japan. This instrument is a best suited medical device which can measure above 20 keV of X and Gamma rays. It is a direct-reading dosimeter which displays an accumulated dose. The range of dose measurement used in the EPD varied from 1-9999 μSv. It has a silicon semiconductor detector and calibrated by Am-241 using a slab phantom. In order to prevent of physical damages, this EPD was kept inside a prepared radiolucent cloth bag. To measure the dose, EPD was placed on the neck where thyroid gland is located (at a point mid-way between the sternal notch and the cricoid cartilage in the midline) [9].

D. Statistical Analysis
SPSS version 15 was used as statistical tools. P-value less than 0.001 was considered statistically significant. Comparison of average surface dose of the thyroid gland during chest radiography with the value reported by Karami et al. [9] in Iran using thermo-luminescent dosimeters (TLD) was made using z-test.

III. RESULTS
Patients age was under 12 years, the average weight and height of patients were 21.3±6.8 kg (9.5 - 42) and 121.2±10.7cm (97 - 157), respectively. The tube voltage was between 44 and 70 kVp at 3 to 6.25 mAs. The average thyroid surface dose was 0.0127±0.0081 mGy compared with the average thyroid surface dose given in the similar literature of 0.065±0.053 mGy. The result of the present study produced a statistically significant decrease in the average thyroid dose when compared with above value (P-value < 0.001).

Fig. 1. Radiation dose distribution among patients.
IV. DISCUSSION

Gustafsson et al. [10] investigated the risk of future radiation inducing malignancies due to infant and children chest radiography and highlighted that radiation induced leukemia and thyroid carcinoma constituted the greatest risk of future malignancies.

Due to the cumulative dose and stochastic risks there should be a real concern about radiation dose received by the organs when an individual undergoes multiple and more frequent X-ray examinations such as the chest X-ray that is the most frequent X-ray examination throughout the world [11]. Eisenberg et al. [12] and Brenner et al. [13] revealed that multiple procedures in an individual patient can result in a cumulative dose of more than 50 mSv per year that approaches or exceeds the levels which known as increased cancer risk.

With regards to CT scans and other diagnostic radiographies, the American Thyroid Association (ATA) recommends the use of thyroid shields when possible to protect the thyroid. These procedures may involve clinically relevant radiation doses to the thyroid, especially when more than one examination is performed, and the goal is to reduce thyroid exposure as much as feasible.

In our study, average surface dose received by thyroid region was 0.0127±0.0081 mGy and this is lower than the value of 0.065±0.053 mGy given in only one published similar study done in Iran using TLDs.

Due to lack of national diagnostic reference levels (DRL) for X-ray imaging and published national or international report on the thyroid surface dose in X-ray imaging, it is impossible to say the current dose values are acceptable or not.

However, we hope this study will play a small role in setting DRLs for paediatric chest X-ray imaging in SriLanka with the help of further studies.

V. CONCLUSION

The measured surface doses in our study don’t exceed the doses reported by Karami et al. [9]. However, as in Sri Lanka there is no national DRLs for chest X-ray examination, it is not clear whether the current dose values are acceptable or not.

The authors wish to suggest that establishing of national diagnostic reference levels is important so that the researchers can compare their work and change their attitude and philosophy. It can be concluded that the further studies should be done to establish those DRLs.

Moreover, surface dose received by thyroid gland during chest X-ray examination can be further reduced by protecting the thyroid using lead shields.

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Effects of Macroeconomic Conditions on Non-Performing Loan in Retail Segments: An Evidence from the Indonesian Banking

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Abstract- The fluctuation of global economy condition in 2014 – 2015 will continuously change up to the end of 2016 and it makes uncertainty for players in industrial sectors of developing countries, including Indonesia. The changing of macroeconomic factors like Gross Domestic Product (GDP) that is represented by Industrial Production Index (IPX), Currency Exchange Rate, BI rate, Consumer Price Index (CPI), and The Total of Money Circulation (M2) that happens in that period of time which also influences the banking industrial sector in Indonesia. Loan provision for Small Medium Enterprises (SMEs), which is generally known by retail segment, is facing a deceleration causing Non Performing Loan (NPL) on that segment. By using times series data on the macroeconomy variables and then it is conducted and analyzed by using Vector Error Correction Model (VECM) can be obtained that the NPL level in retail segment is influenced from the changing factors or macroeconomy variables. In short time, the variable of money circulation (M2) will be a macroeconomy variable that has positive and significant impact towards NPL in retail segment, meanwhile in long term, currency exchange rate variable and the total money circulation (M2) will be macroeconomy variables that have positive impacts towards the NPL in retail segment.

Index Terms- Macroeconomic Factors, Banking Industry, Retail Segment, Non Performing Loan

I. INTRODUCTION

In period of 2014 – 2015 and up to 2016, there wasa fluctuative condition in global economy that gives uncertainty for players in industrial sectors of developing countries, including Indonesia. This deceleration phenomenon about the exchange rate Rupiah against US Dollar (USD) occurs since the early of 2014 that reach up to 14% until in the middle of December 2014 and it’s keep decelerating up to 16% on the third quartal of 2015 (year to date), even up to the end of 2016 and the first semester of 2017 the rupiah exchange rate always lies above Rp. 13.000 per US Dollar.

It is also followed by the inflation that shows a rising trend, reflected by an excessive growing of CPI during the period. By this condition, Bank Indonesia (BI) creates a regulation to increase the BI rates even up to 7.75%. The deceleration of rupiah currency against US Dollar, the hype of inflation and regulation to raise BI rates in the period of 2014 – 2015 create an impact to any industries in Indonesia, including banking sector especially, there is a deceleration in loan growing level as in small medium enterprise loan or as is known by retail segment.

In other side, since the 2014 – 2015 up to middle of 2016, small medium enterprise IPX as the representation of the GDP, for this segment and money circulation (M2) in Indonesia is merely shows a growing trend, even though there is also a deceleration. By this global and local economy condition as is explained above, the troublesome loan or NPL in banking industry in Indonesia is growing. It is experienced by on of the big bank in Indonesia that has business core which mostly in retail segment. The macroeconomy factor like GDP that is represented through IPX, rupiah exchange towards USD, CPI, BI rate and money circulation (M2) are external or macroeconomy factors that is assumed influencing the NPL. This is the background of the study to do further research.

II. LITERATURE REVIEWS

The exchange rates of Indonesia Rupiah is value or price of domestic rates comparing to others (Salvatore, 2008). Trading between each countries in between each of them has their own exchange tools emphasizing a comparative value between one currency to others that is called foreign exchange or currency. Consumer Price Index (CPI) is a cost metrics of the whole goods and services that is bought by consumer. According to Case and Fair (2002), inflation is a growth of price level entirely. It can be happen when the price growing simultaneously. Meanwhile, inflation rate is a rates on the price index from previous period (Mankiw, 2012). BI rate is a regulation of interest rates that reflects a stance in determining the monetary policy that is firm by Bank Indonesia, announced to public and implemented on monetary operation that is done by Bank Indonesia through liquidity management in money market to achieve the monetary policy. Industrial Production Index (IPX) is a measurement of the changing in real of the total production in certain industry that can be calculated nationally. Because of the stocks of GDP data that only occurs every one quartal, for the approach to measure the economy growth can be used another indicator that is Industrial Production Index (IPX) as is used by
Kasri and Kassim (2009). According Lipsey et al. (1993) total money circulation can be identified as a total stocks in the economy of a certain period. Non Performing Loan (NPL) is a financial term that shows a constraints in paying a loan / claim.

Many studies have been conducted on Non Performing Loan (NPL) and influence of macroeconomic factors in banking sector. For example, a study by Zaib (2014) stated that NPL is affected by the external macroeconomic factors such as GDP, growth rate, exchange rate, lending interest rate, inflation rate, and unemployment rate. Makri et al (2014) and Warue (2013) also stated that there is a strong relationship between NPL and macroeconomic variables such as GDP, interest rates level, inflation, and exchange value.

III. DATA AND METHODOLOGY

Data in this study consist of NPL of retail segment from 2010 to 2016 at the bank. The variable used are macroeconomic variables in which IPX, exchange rates or Rupiah currency against US Dollar, CPI, BI rate, and total money circulation (M2). The choosing and data limitation and variable on this study is based on the data availability. The type of data that is used on this study is secondary data with time series type in a form of Industrial Production Index (IPX), Rupiah exchange against US Dollar, CPI, BI rate and total money circulation and also NPL data of Bank XYZ retail segment during the period 2010 up to 2016. Bank XYZ is one of the big banks in Indonesia that showing the lowest loan growth in first quartal of 2016 and comparing to other bank in first quartal, it shows the biggest NPL ratio growth in retail segment comparing to other bank. Time series data as IPX is acquired from Statistic Department (BPS), rupiah exchange data against US Dollar, CPI, BI rate dan total money circulation (M2) is acquired from Bank Indonesia website http://www.bi.go.id. Meanwhile NPL data of retail segment is acquired from Bank XYZ. The software that is used in this study is Microsoft Excel 2010 to collect the data then after that to be conducted by using Eviews program. One of the research variable, which is IPX variable that consists of data series that is acquired quarterly so that to match with VECM model, the data series are using monthly data, thus it is done an interpolation towards this quarterly data series by using CubicSpline. Then, data analysis technique that is used in this study is using Vector Auto Regression (VAR) method or Vector Error Correction Model (VECM).

The general VAR equation model that will be used to find the relationship between each macroeconomic variables in NPL retail segment level will follow the general model below:

\[ y_t = A_0 + A_1 y_{t-1} + A_2 y_{t-2} + \ldots + A_p y_{t-p} + \varepsilon_t \] .................. 1)

Description:
\( y_t \): Vector from endogen variable sized \((n \times 1)\), that is NPL retail segment variable and macroeconomic variables (IPX, CPI, Exchange Rate, BI rate, and total circulation money)
\( A_0 \): Intercept vector sized \((n \times 1)\)
\( A_1 \): Coefficient matrix / parameter sized \((n \times n)\) for each \(i = 1, 2, \ldots, p\)
\( \varepsilon_t \): Error vector sized \((n \times 1)\)

Meanwhile, whenever using VECM model, the VECM general equation model inside this study is described below:

\[ \Delta y_t = \mu_0 x_t + \mu_1 x_t + \Pi y_{t-1} + \sum_{t=0}^{k-1} \Gamma_{t} \Delta y_{t-1} + \varepsilon_t \] .................. 2)

Description:
\( \Delta y_t \): Vector from the endogen variable difference sized \((n \times 1)\), that is NPL retail segment variable and macroeconomic variables (IPX, Exchange Rate, CPI, BI rate, and total circulation money/M2)
\( \mu_0 \): Intercept vector from a model
\( \mu_1 \): Regression coefficient vector from a model
\( t \): Time trend
\( \Pi \): First difference of long-term co-integration equivalence
\( \gamma_{t-1} \): Variable in level
\( \Gamma \): Regression coefficient matrix
\( k-1 \): VECM class from VAR
\( \varepsilon \): error term

IV. DISCUSSION AND RESULT

Non Performing Loans (NPL) is one of the main performance ratios that is generally used by bank to measure their ability to cover failed risk (default) based on debtor loan refund. It can be said that NPL has a risk in loan. Due to it represents loan risk, the more NPL also represent, the lower loan risk that is guaranteed by bank. Analysis ability factors that are done by bank to give loan
determine the eligibility of their debtor to pay back the obligation (first way out). Then, after loan is given, the bank is obligated to do a monitoring to the debtor by keeping observing them the eligibility and discipline aspects in fulfilling the obligation in the given period of time. Besides strengthen in the first way out, bank should also do the analysis to the guarantees as a second way out for the loan given through a commitment agreement of the loan by legal. All of the banks in Indonesia have responsibilities to keep maintaining the NPL below 5% (bank wide) so that it can’t be categorized Bank Under Intensive Monitoring as legalization in Bank Indonesia Regulation. The mobility of payment performance of retail segment debtor is influenced by other internal factors if its debtor, also it is affected by external factors such as the condition of economy climate and also other economy instruments, thus by time series it faces NPL fluctuation date to date.

Then, in this section it will be explained that the result given based on the shortlist or VAR/VECM modelling procedure that is done related to time series data conducting of all variable in this study:

**Stationarity Test**

The main time series data analysis requirement on each data that is done is stationary. In stationarity test that is conducted as it’s shown on table 1, all of the variable on this stationarity study for the first difference so that the data analysis technique that is done in this study is using VECM methods.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Level t statistics</th>
<th>Level Prob</th>
<th>Level Desc</th>
<th>First Difference t statistics</th>
<th>First Difference Prob</th>
<th>First Difference Desc</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPL</td>
<td>-2.274487</td>
<td>0.1828</td>
<td>Not stationair</td>
<td>-3.485210</td>
<td>0.0110</td>
<td>Stationary</td>
</tr>
<tr>
<td>LNEXCHANGE RATE</td>
<td>-2.498630</td>
<td>0.3282</td>
<td>Not stationair</td>
<td>-9.262572</td>
<td>0.0000</td>
<td>Stationary</td>
</tr>
<tr>
<td>IPX</td>
<td>1.011866</td>
<td>0.9964</td>
<td>Not stationair</td>
<td>-3.317838</td>
<td>0.0173</td>
<td>Stationary</td>
</tr>
<tr>
<td>CPI</td>
<td>-1.963033</td>
<td>0.6122</td>
<td>Not stationair</td>
<td>-8.225197</td>
<td>0.0000</td>
<td>Stationary</td>
</tr>
<tr>
<td>BIRATE</td>
<td>-1.428810</td>
<td>0.5643</td>
<td>Not stationair</td>
<td>-6.239812</td>
<td>0.0000</td>
<td>Stationary</td>
</tr>
<tr>
<td>LNM2</td>
<td>-1.969515</td>
<td>0.6090</td>
<td>Not stationair</td>
<td>-11.22955</td>
<td>0.0001</td>
<td>Stationary</td>
</tr>
</tbody>
</table>

**Optimal Lag Test**

After the data is selected by using VECM method, then it is done by using optimal lag. The selection of optimal lag in this model by using minimum lag recommendation value based on 5 optimal lag examination that lies in Eviews application, such as LR test statistics (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), dan Hannan-Quinn Information (HQ). Based on the lag optimal test table on table 2 below, it can be known that optimal lag test can be tried until get the highest lag, which is up to 7-lag (AIC). It indicates that on that lag there are no autocorrelation problem.

<table>
<thead>
<tr>
<th>Lag</th>
<th>LogL</th>
<th>LR</th>
<th>FPE</th>
<th>AIC</th>
<th>SC</th>
<th>HQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>-342.7799</td>
<td>NA</td>
<td>0.000346</td>
<td>9.059218</td>
<td>9.241852</td>
<td>9.132270</td>
</tr>
<tr>
<td>1</td>
<td>213.2435</td>
<td>1010.952</td>
<td>4.73e-10</td>
<td>-4.447882</td>
<td>-3.169443</td>
<td>-3.936517</td>
</tr>
<tr>
<td>2</td>
<td>299.7838</td>
<td>143.8593</td>
<td>1.29e-10</td>
<td>-5.760619</td>
<td>-3.386374*</td>
<td>-4.810942</td>
</tr>
<tr>
<td>3</td>
<td>362.8127</td>
<td>94.95261</td>
<td>6.69e-11</td>
<td>-6.462668</td>
<td>-2.992618</td>
<td>-5.074678</td>
</tr>
<tr>
<td>4</td>
<td>436.3857</td>
<td>99.37126</td>
<td>2.74e-11</td>
<td>-7.438588</td>
<td>-2.872734</td>
<td>-5.612287</td>
</tr>
<tr>
<td>5</td>
<td>489.8266</td>
<td>63.85155</td>
<td>2.01e-11</td>
<td>-7.891601</td>
<td>-2.229941</td>
<td>-5.626987</td>
</tr>
<tr>
<td>6</td>
<td>529.9744</td>
<td>41.71192</td>
<td>2.27e-11</td>
<td>-7.999334</td>
<td>-1.241869</td>
<td>-5.296407</td>
</tr>
<tr>
<td>7</td>
<td>622.6069</td>
<td>81.80537*</td>
<td>7.38e-12*</td>
<td>-9.470309*</td>
<td>-1.617039</td>
<td>-6.329070*</td>
</tr>
</tbody>
</table>

However, based on the test that is done several times and to get best model especially when the variables are impulsed and to get the stability for a long term, the best model can be obtained at lag 2.

**VAR Stability Test**

According to the VAR stability test (Table 3), it can be guessed that VECM model that is used to analyse IRF and FEVD is stable. VECM stability requirement model should have modulus value between 0 and 1.
Table 3: VAR Stability Test

<table>
<thead>
<tr>
<th>Root</th>
<th>Modulus</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.953095 - 0.017012i</td>
<td>0.953247</td>
</tr>
<tr>
<td>0.953095 + 0.017012i</td>
<td>0.953247</td>
</tr>
<tr>
<td>0.734984 - 0.502581i</td>
<td>0.890387</td>
</tr>
<tr>
<td>0.734984 + 0.502581i</td>
<td>0.890387</td>
</tr>
<tr>
<td>0.781630</td>
<td>0.781630</td>
</tr>
<tr>
<td>0.37551 - 0.298606i</td>
<td>0.479795</td>
</tr>
<tr>
<td>0.37551 + 0.298606i</td>
<td>0.479795</td>
</tr>
<tr>
<td>0.382655</td>
<td>0.382655</td>
</tr>
<tr>
<td>-0.251020 - 0.082682i</td>
<td>0.264286</td>
</tr>
<tr>
<td>-0.251020 + 0.082682i</td>
<td>0.264286</td>
</tr>
<tr>
<td>0.059563</td>
<td>0.059563</td>
</tr>
</tbody>
</table>

Cointegration Test

Based on cointegration test, the estimation result gives an overview that on each models they have more than one cointegration on a real level of 5. The total rank information as shown in Table 4 used as an error correction model (ECM), that will be included on the VAR model become VECM.

Table 4: Cointegration Test Results

<table>
<thead>
<tr>
<th>Hypothesized No. of CE(s)</th>
<th>Trace Eigenvalue</th>
<th>Trace Statistic</th>
<th>Critical Value</th>
<th>Prob.**</th>
</tr>
</thead>
<tbody>
<tr>
<td>None *</td>
<td>0.656823</td>
<td>214.9448</td>
<td>150.5585</td>
<td>0.0000</td>
</tr>
<tr>
<td>At most 1 *</td>
<td>0.373524</td>
<td>127.2452</td>
<td>117.7082</td>
<td>0.0108</td>
</tr>
<tr>
<td>At most 2 *</td>
<td>0.309964</td>
<td>88.89832</td>
<td>88.80380</td>
<td>0.0492</td>
</tr>
<tr>
<td>At most 3</td>
<td>0.259753</td>
<td>58.47533</td>
<td>63.87610</td>
<td>0.1309</td>
</tr>
<tr>
<td>At most 4</td>
<td>0.181866</td>
<td>33.81208</td>
<td>42.91525</td>
<td>0.2972</td>
</tr>
<tr>
<td>At most 5</td>
<td>0.107927</td>
<td>17.35231</td>
<td>25.87211</td>
<td>0.3891</td>
</tr>
<tr>
<td>At most 6</td>
<td>0.092813</td>
<td>7.987357</td>
<td>12.51798</td>
<td>0.2527</td>
</tr>
</tbody>
</table>

Granger Causality Test

Granger causality test that is done in this study is to determine the relationship between one variable to another variable. All of the variables can be considered as dependent or independent factors. In other words, all of the variables has a chance to influence or to be influenced by other variable. It is served with Granger causality test from each models.

Table 5: Granger Causality Test Results

<table>
<thead>
<tr>
<th>NPL</th>
<th>LNEXCHANGE RATE</th>
<th>IPX</th>
<th>CPI</th>
<th>BIRATE</th>
<th>LNM2</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LNEXCHANGE RATE</td>
<td>←</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IPX</td>
<td></td>
<td>←</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CPI</td>
<td></td>
<td></td>
<td>←</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIRATE</td>
<td></td>
<td></td>
<td></td>
<td>←</td>
<td></td>
</tr>
<tr>
<td>LNM2</td>
<td></td>
<td>←</td>
<td>←</td>
<td>←</td>
<td></td>
</tr>
</tbody>
</table>

Based on the causality test (Table 5), between IPX and EXCHANGE RATE variable has two-way relationship, so that the IPX and CPI variable, and M2 with EXCHANGE RATE variable. Meanwhile the NPL variable has one-way relationship with BI rate variable, the result on table 5 shows a one-way relationship between CPI against EXCHANGE RATE, BI rate against EXCHANGE RATE, BI rate against CPI, M2 against IPX and M2 against CPI.

VECM Model Results

VECM estimation that is done to see the long term and short term analysis. Good VECM results for long term or short term can be seen on Table 6:
Table 6: VECM Estimation Result

<table>
<thead>
<tr>
<th>Variable</th>
<th>Short Term</th>
<th>Coef</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>CointEq1</td>
<td>-0.038809**</td>
<td>[2.49175]</td>
<td></td>
</tr>
<tr>
<td>D(NPL(-1))</td>
<td>-0.184907</td>
<td>[-1.36775]</td>
<td></td>
</tr>
<tr>
<td>D(NPL(-2))</td>
<td>-0.164394</td>
<td>[-1.26398]</td>
<td></td>
</tr>
<tr>
<td>D(BIRATE(-1))</td>
<td>-0.436302</td>
<td>[-1.16628]</td>
<td></td>
</tr>
<tr>
<td>D(BIRATE(-2))</td>
<td>-0.089034</td>
<td>[-0.22748]</td>
<td></td>
</tr>
<tr>
<td>D(EXCHANGE RATE(-1))</td>
<td>-2.919429</td>
<td>[0.90085]</td>
<td></td>
</tr>
<tr>
<td>D(EXCHANGE RATE(-2))</td>
<td>3.876883</td>
<td>[1.15569]</td>
<td></td>
</tr>
<tr>
<td>D(M2(-1))</td>
<td>11.863759*</td>
<td>[1.68476]</td>
<td></td>
</tr>
<tr>
<td>D(M2(-2))</td>
<td>12.807019*</td>
<td>[1.91388]</td>
<td></td>
</tr>
<tr>
<td>D(CPI(-1))</td>
<td>0.082428</td>
<td>[0.66542]</td>
<td></td>
</tr>
<tr>
<td>D(CPI(-2))</td>
<td>0.110219</td>
<td>[0.89086]</td>
<td></td>
</tr>
<tr>
<td>D(IPX(-1))</td>
<td>0.004503</td>
<td>[0.05092]</td>
<td></td>
</tr>
<tr>
<td>D(IPX(-2))</td>
<td>-0.036926</td>
<td>[-0.42147]</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Long Term</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>IPX(-1)</td>
<td>-0.00145452**</td>
<td>[2.30546]</td>
<td></td>
</tr>
<tr>
<td>EXCHANGE RATE(-1)</td>
<td>0.5609662439**</td>
<td>[2.88384]</td>
<td></td>
</tr>
<tr>
<td>BIRATE(-1)</td>
<td>0.006837253</td>
<td>[0.49202]</td>
<td></td>
</tr>
<tr>
<td>CPI(-1)</td>
<td>-0.014123069**</td>
<td>[2.09679]</td>
<td></td>
</tr>
<tr>
<td>M2(-1)</td>
<td>0.3673964989**</td>
<td>[2.17927]</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>-6.2010689</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-squared</td>
<td>0.306992</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adj. R-squared</td>
<td>0.172528</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-statistic</td>
<td>2.283075</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: *shows a significant variable on 10% level. **shows a significant variable on 5% level.

From table 6 it can be known from the VECM estimation result for short term and long term as in below:

a. Long Term

- IPX has negative and significant influence against NPL growth on retail segment during research period as 0.00145452. It means, once IPX is growing 1%, then NPL of retail segment will fall to 0.00145452%. The finding is similar with the study conducted by Akinlo and Emmanuel (2014). They stated that the economy growth represented by GDP gives a negative impact to NPL in the long run. Messai and Jounini (2013) also stated that GDP and ROA have negative impact towards NPL, meanwhile the unemployement and interest rates give positive impact. The deceleration of economy represented by GDP and in detail is represented through IPX from each industry is a main cause for the hype of NPL inspite of other factors like unemployement and. Skarica (2014) stated that the main cause of the hype of NPL is there is an economy deceleration that can be seen from the CPIlevel, unemployement and CPI. If the production output that is located on a country falling, it indicates there is a depression on business performance. It effects against financial performance of a debtor so it will increase the payment fail ratio that leads problematic loans.

- EXCHANGE RATE has positively significant against the growth of NPL of retail segment during a period of conductivity is 0.5609662439. It means, once EXCHANGE RATE is increasing by 1%, then the NPL of retail segment will be increasing up to 0.5609662439%. It is aligned with Akinlo and Emmanuel (2014) which stated that the currency exchange has a positive impact to NPL. The currency exchange between USD/IDR that is depressed will be followed by the increasing of NPL, that is caused by value exchange in which it represent relative price only in domestic by with that is situated on foreign countries. When the value exchange is depressed, then the goods and service import will push the business income through each players in which in this circle process is flowing through import mechanism. It can be depicted to explain the condition in which the exchange value is relatively influencing against loan provision in a foreign exchange. When the exchange rate depreciates, the principal amount of the loan in the rupiah denomination will increase and the interest expense to be paid by the debtor will also increase. It may burden the debtor's performance and may cause the debtor to default and potentially lead to problem loans. According to Kaminsky and Reinhart (1999), the unexpected depreciation of the domestic currency exchange rate threatens bank profitability and NPL performance. Another thing that can also explain this condition is the influence of the exchange rate is relatively influential on the provision of credit in foreign currency. When the exchange rate depreciates, the principal amount of the loan in the rupiah denomination will increase and the interest expense to be paid by the debtor will also increase. It may burden the debtor's performance and may cause the debtor to default and potentially lead to problem loans.
loans. According to Kaminsky and Reinhart (1999), the unexpected depreciation of the domestic currency exchange rate threatens bank profitability and NPL performance.

- The BIRATE variable has a positive and insignificant effect on the NPL of the retail segment (0.006837253). It means when BIRATE increases by 1%, then the NPL of retail segment will increase by 0.006837253%. The increased interest rate will be accompanied by an increase in NPL. This condition is caused by the increase in the interest rate (BI Rate) will be responded by raising lending rates. This will have an impact on debtors who have to pay a larger credit interest burden. The increase in interest expense payable by the debtor will increase the likelihood of the debtor failing to pay. This is supported by previous research from Ekanayake and Azeez (2016) which states that interest rates have a positive effect on NPL. According to Ahmad et al. (2008) and Giesecke et al. (2014), in long-term perspective, deteriorating corporate condition or corporate failures are positively and significantly influenced by changes in macroeconomic factors, such as interest rates. Specifically, it may affect the individual performance of the debtor and subsequently the deteriorating performance of the debtor will have an impact on the NPL rate increase.

- The CPI variable has a negative and significant influence on the NPL of the retail segment during the research period of 0.014123069. Which means, when the CPI increased by 1%, then the NPL of retail segment will decrease by 0.014123069%. This is in line with the results of research from Ekanayake and Azeez (2016) which states that the CPI negatively affect the NPL. Touny and Shehab (2016) also concluded that CPI rates and improved macroeconomic and financial conditions had a negative impact on NPL levels. There is even a research from Owusu-Antwi et al. (2016) stating that CPI has no effect on banking performance including NPL.

- Variable Amount of Money Supply (M2) has a positive and significant influence on NPL of retail segment during the research period of 0.3673964989. Which means, when M2 increases by 1%, then the NPL of retail segment will increase by 0.3673964989%. This is in accordance with research from Rashid (2014) which states that the money supply has a positive and significant effect on the NPL. The greater the amount of money in circulation (M2), will indicate the higher public purchasing power that can increase the level of public consumption and in the long run can encourage high CPI levels and ultimately can affect the business world. This condition will affect the debtor's performance in the long run. The increase of M2 in that period can cause the price increase of goods which further causes the increase of operational expense and the decrease of demand from the consumer so that it can affect the financial performance of the business actors, which in the end may impact on ability to pay the debtor in fulfilling its obligation to the bank. The greater the money supply (M2), indicating the higher purchasing power of the public that can increase the level of consumption of the people and in the long run can increase inflation (Ihsan and Anjum, 2013).

b. Short-Term

In the short term, only one variable of the macroeconomics conditions affects to NPL of the bank. The M2 variable has a positive and significant effect on the NPL of the retail segment are only M2 variables. Other macroeconomic variables which also have a positive but not significant influence are the EXCHANGE RATE and CPI variables, while the BIRATE and IPX variables have a negative and insignificant effect on the NL retail segment. This is in accordance with research from Rashid (2014) which states that money supply has a positive and significant effect on NPL. The greater the amount of money in circulation (M2), will indicate the higher public purchasing power that can increase the level of public consumption and in the long run can encourage high CPI levels and ultimately can affect the business world. This condition will affect the debtor's performance in the long run. The increase of M2 in that period can cause the price increase of goods which further causes the increase of operational expense and the decrease of demand from the consumer so that it can affect the financial performance of the business actors, which in the end may impact on ability to pay the debtor in fulfilling its obligation to the bank. The greater the money supply (M2), indicating the higher purchasing power of the public that can increase the level of consumption of the people and in the long run can increase inflation (Ihsan and Anjum, 2013).

From the explanation of the VECM model estimation result in the long-term and short-term above, it should also be considered that there are other factors outside macroeconomic factors which can also affect the NPL, including NPL of retail segment, that is internal factor of each bank as perpetrators of the banking sector as well as factors of the debtor itself. Internal factors of the bank include weaknesses in the process of credit analysis conducted by the Bank. This is in accordance with research from Richard (2011) which concludes that a weak credit analysis becomes an NPL factor. In addition, the size of the bank and the size of the loan provided also affected the NPL, according to research from Yang Li (2003) which stated that the size of the bank loan and the size of the bank correlated positively to the NPL ratio. Malik et al. (2016) also states that the internal causes of bank size (total assets) have a positive and significant influence on bank performance, among others, ROE, ROA and NPL. Furthermore, other factors that may also affect the NPL are the factors of the debtor itself, namely the business experience and business diversification by the debtor (Damayanti, 2016).

**Impulse Respon Function (IRF) Analysis**

*Impulse Respon Function* (IRF) is shown in Figure 1. It shows how the NPL variable of retail segment responds a shock of macroeconomy variable such as IPX, EXCHANGE RATE, BIRATE, CPI, and M2 during 100 period forward:
Figure 1 NPL of retail segment Response if IPX, EXCHANGE RATE, BIRATE, CPI M2 are impulse

Based on the results of impulse response in Figure 1 can be explained that the negative NPL response is below the equilibrium point if the IPX variable is impulsed, the shock period until the 9th period and stable after the 9th period, the shock of 1 standard deviation impacts the NPL decrease of 0.02%. While the shocks that occur in EXCHANGE RATE variables responded positively by the NPL. Shock of 1 standard deviation impacted the NPL which decrease by 0.23% in the third period, then stabilized in the 9th period. The shocks that occur in the BIRATE variable are responded negatively by the NPL. Shock of 1 standard deviation resulted in decrease of NPL equal to 0.02% only until 14th period and the influence instantly rose (positive) of 0.03% after 14th period, NPL stabilized to BIRATE variable shock after 14th period. The shocks that occur in the CPI variable are positively responded by the NPL. Shock of 1 standard deviation resulted in NPL increase of 0.05% in the 4th period, then decreased (negative) after the 10th period of 0.0018%. Meanwhile, NPLs respond positively to shocks that occur in variable M2. Shock of 1 standard deviation impacted the NPL increase by 0.14% in the 9th period and started to stabilize after the 10th period.

**Forecasting Error Variance Decomposition (FEVD) Analysis**
An analysis of the dominant macroeconomic variables contributing to the change in NPL of the retail segment is by using the output of Forecasting Error Variance Decomposition (FEVD). An analysis based on FEVD will show the macroeconomic variables that make up the largest contribution to the long-term NPL in the retail segment. The dynamic structure between variables in VAR can be seen through FEVD analysis, where the pattern of FEVD indicates the nature of multivariate causality among the variables in the VAR model. The sorting of variables in FEVD analysis is based on cholesky katorization. The following will present the results of the FEVD analysis of the NPL of the retail segment in Figure 2:

Based on the variance decomposition results above, at the first period the variability and NPL value fluctuation can be explained on 100% by the NPL score itself, meanwhile the impact of other variable is not yet seen. The impact of other variable can be seen started in the second period, where EXCHANGE RATE give the most second fluctuation which reach 25% that is followed by M2 which reach 14%. IPX variable only give variability and fluctuation only 0.3% and BIRATE variable only gives variability and fluctuation around 0.4% whereas CPI variable only gives variability and fluctuation around 0.5%.

**Managerial Implications**

Based on the results of the discussion in the previous section, there are managerial implications that can be used by various parties in making decisions, among others useful as an early warning indicators if there is a shock to macroeconomic variables entered in the scope of this study. Managerial implications for banking practitioners as creditors who disburse credit is to anticipate macroeconomic factor changes in credit schemes to debtors, for example in the event of fluctuations in the rupiah exchange rate against the US dollar and according to the bank this may take a long time, the bank can reduce the portion of loan disbursement to debtors whose business field is directly related to export / import activities because it is directly related to the exchange rate of exchange which potentially causes losses in the foreign exchange transaction. Furthermore, the recommendation for debtors that most of the direct transactions relating to the exchange rate is by hedging mechanisms against transactions that could potentially disrupt cash flow or sources of business revenues, as well as seek other sources of funding other than banks to meet the funding requirements for operational sustainability business.

The next implication is in the form of recommendations to banking practitioners to be more stringent in monitoring the quality of their credit portfolios in the event of shocks to macroeconomic variables, especially shocks on the variable exchange rate. This is due to the exchange rate variable contribution in the contribution to NPL. Recommendations for regulators include the need for intensive coordination between Bank Indonesia (BI) and the Financial Services Authority (FSA) respectively as holders of monetary authority and supervision of the banking system in the event of or before economic shocks. The role of BI in maintaining the stability of monetary conditions and the role of OJK in supervising banks can be coordinated in order to keep the banking condition strong and stable. This becomes crucial given the potential for systemic risk arising during the disturbance of the banking system.

V. CONCLUSION AND RECOMMENDATIONS

**Conclusion**

It can be concluded that there is a relationship between macroeconomic variables changes with NPL of segment retail. The NPL level of the retail segment may be affected by changes in macroeconomic factors or variables such as IPX, Exchange Rate, BIRATE, CPI, and Total Money Supply (M2). These macroeconomic variables have an effect on NPL of retail segment in the short and long term. In the short term macroeconomic variables that have a positive and significant influence on NPL of retail segment only variable Money Supply (M2). In the long term, macroeconomic variables that have positive and significant influence are the variables...
of Exchange Rate and the Money Supply (M2), the BI Rate variable also has a positive but not significant influence. Meanwhile, the macroeconomic variables that have a negative and significant influence are the IPX and CPI variables. In the long term, the macroeconomic variables that most influence the NPL of retail segment are the Exchange Rate variables. From the results of Impulse Response Function (IRF) analysis performed, the shock on the IPX variable will affect other macroeconomic factors in the longer term. Furthermore, the macroeconomic variables that provide the greatest contribution to the change of NPL of retail segment are the variables of exchange rate and the money supply (M2), while other variables such as IPX, BI Rate and CPI are the least variable of contribution to the change of NPL of retail segment.

Recommendations

Suggestions that can be given related to the result of this research is mainly for banks in order to give credit which always can consider the change of condition macroeconomic condition and bank expected to actively and aware to macroeconomic situation development so that macroeconomic changes can be identified earlier and can be anticipated the effect of such changes on the performance of banks, especially the NPL level. Furthermore, the suggestions that can be given related to the next research development is in addition to macroeconomic factors, it is also necessary to consider the condition of bank internal factors such as human resources, infrastructure, risk management undertaken, internal regulations etc. as other factors that can affect NPL in addition to internal factors of the debtor itself. In addition, the scope of research can be extended to all banks that have loan portfolios to small businesses, both conventional banks and sharia banks and so that further research is expected to enrich the study of the dynamics of changes in banking conditions to changes in economic conditions.

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Road Traffic Accident in Owerri; a Five Year (2000-2004) Autopsy Study

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2Department of Pathology and Forensic Medicine, Obafemi Awolowo University, Ile-ife.

Abstract- Aim: To estimate the demographic, injury pattern and causes of death among road traffic accident victims in Owerri metropolis.

Methodology: Autopsies performed in the Department of Pathology, FMC Owerri was used for the extraction of data which was analyzed with SPSS version 16.0

Results: The male to female ratio was 4:1 with mean age of 36.63±16.07. The age range was 4 to 87 years. The most affected age range was 20-60 years with a peak among the 21-30 years(29.63%) followed by 31-40 (19.26%) and 41-50 years (17.78%) age groups. Head injuries were the commonest type of injuries followed by injuries to the extremities and thorax. The causes of death were as follows: Haemorrhagic shock 75 (55.56%), head injuries 53 (39.26%), septicaemia 4 (2.96%) and exsanguinations 3 (2.22%).

Conclusion: RTA is the most common contributor to the loss of viable labour force in our center and institution and effective implementation of proper traffic and road safety regulations would play vital role to control the menace.

Index Terms- Road, accident, autopsy, Owerri

I. INTRODUCTION

Road traffic accident is a major cause of death worldwide with exceptional impact in the developing countries. World Health Organization (WHO) reports that road traffic injuries (RTI) killed an estimated 1.2 million victims in 1998 worldwide.1 Deaths from injuries are projected to rise from 5.1 million in 1990 to 8.4 million in 2020 with increase in RTI as a major cause of this rise. Current deaths from RTI account for 2.2% of the global mortality affecting all age groups.2 Road traffic accidents (RTA) are continuing to be an occurrence of epidemic proportions both in the developed and developing countries, statistically it is becoming one of the leading causes of mortality and morbidity with 90% of road traffic deaths occurring in low and middle income countries.3,4

African countries appear to be the most affected with average mortality rate of 26.6 per 100,000 compared to 9.3, 16.1, 17.4 per 100,000 in the UK, North America, and South-east Asia respectively.5 There are variations among the countries within these regions, for instance, mortality rates in South-east Asia ranges from 3.5 in the Maldives to 36.2 in Thailand and in the American sub-region from 11.0 in North America to 22.2 in the Latin Caribbean per 100,000.6 Considering these overwhelming figures, more systematic efforts are needed if the global target of a 50% reduction in road crash deaths is to be achieved by 2020.5

The aim of this study is to estimate the demographic, injury pattern and causes of death among road traffic accident victims in Owerri metropolis and compare our finding to other works done in different parts of Nigeria.

II. METHODOLOGY

Study design: A descriptive cross-sectional study.
Study Area: Owerri, Imo state, Nigeria.
Study population: Owerri consists of three Local Government Areas including Owerri Municipal, Owerri North and Owerri West, it has an estimated population of about 401,873 as of 20067 and is approximately 100 square kilometres (40 sq mi) in area. Owerri is bordered by the Otamiri River to the east and the Nworie River to the south.8

Materials and method: This is a postmortem study of road traffic accident victims in Owerri metropolis of Imo state conducted from 1st Jan, 2000 to 31st December, 2004. These autopsies were conducted in the Pathology department of Federal Medical Centre Owerri and several mortuaries located in Owerri, some of the mortuaries are owned by private hospitals. The postmortem reports were used to extract demographic data and patterns of injuries as well as immediate causes of death. Those victims whose details were incompletely due to autolysis or poor preservation were not included in the study.

Analytical process: These data were analyzed with SPSS version 16.0

Ethical consideration: Ethical clearance for this study was obtained from Research ethics committee Federal Medical Centre Owerri.

III. RESULTS

In the period under review, 135 victims of RTA were autopsied. The male to female ratio was 4:1. The mean age of the victims was 36.63±16.07 years and a range of 4 to 87 years.

The 21-30 years age group (29.63%) was most affected followed by 31-40 (19.26%), 41-50 (17.78%) and 51-60 (12.6%) age groups. This showed that RTA were less common at the very young people below the age of twenty and the elderly were least exposed to RTA. This is shown in table 1.

Skeletal injuries were a significant mode of morbidity and mortality. The commonest bone fractures were recorded in the skull which accounted for 33.01% (69 cases) with variable degrees of cerebral involvement. This was followed by long
bones of the extremities among which fractures of the femur accounted for 16.27% (34 cases), tibia 14.36% (30 cases), fibula and humerus 11.96% (25 cases respectively). The less bones were pelvis 4.3% (9 cases), ulna 2.87% (6 cases), ribs 2.39% (5 cases), vertebræ 1.44% (3 cases), clavicle 0.96% (2 cases) sternum 0.48% (1 case) This is shown in Table 2.

The common sites of injuries were the head and neck region 39.31% (103 cases), the lower limbs 22.51% (59), upper limbs 14.12% (37), thorax 9.16% (24), abdomen 5.73% (15), viscera 5.73% (15) and pelvis 3.44% (9). This is shown in table 3.

The leading causes of death were haemorrhagic shock 75 (55.56%), head injuries 53 (39.26%), septicaemia 4 (2.96%) and exsanguinations 3 (2.22%).

Table 1 shows the number of victims in each age group.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Age group</th>
<th>Freq.</th>
<th>%</th>
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<tr>
<td>1</td>
<td>1-10</td>
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<td>5.18</td>
</tr>
<tr>
<td>2</td>
<td>11-20</td>
<td>12</td>
<td>8.89</td>
</tr>
<tr>
<td>3</td>
<td>21-30</td>
<td>40</td>
<td>29.63</td>
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<td>31-40</td>
<td>26</td>
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<tr>
<td>5</td>
<td>41-50</td>
<td>24</td>
<td>17.78</td>
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<tr>
<td>6</td>
<td>51-60</td>
<td>17</td>
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</tr>
<tr>
<td>7</td>
<td>61-70</td>
<td>5</td>
<td>3.70</td>
</tr>
<tr>
<td>8</td>
<td>71-80</td>
<td>2</td>
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</tr>
<tr>
<td>9</td>
<td>81-90</td>
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</tr>
<tr>
<td>Total</td>
<td></td>
<td>135</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 2. Showing the common sites of skeletal injuries.

<table>
<thead>
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<th>S/N</th>
<th>PART OF THE BODY</th>
<th>Freq</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Head and neck</td>
<td>103</td>
<td>39.31</td>
</tr>
<tr>
<td>2</td>
<td>Chest</td>
<td>24</td>
<td>9.16</td>
</tr>
<tr>
<td>3</td>
<td>Abdomen</td>
<td>15</td>
<td>5.73</td>
</tr>
<tr>
<td>4</td>
<td>Upper limb</td>
<td>37</td>
<td>14.12</td>
</tr>
<tr>
<td>5</td>
<td>Lower limb</td>
<td>59</td>
<td>22.51</td>
</tr>
<tr>
<td>6</td>
<td>Pelvis</td>
<td>9</td>
<td>3.44</td>
</tr>
<tr>
<td>7</td>
<td>Viscera (internal organs)</td>
<td>15</td>
<td>5.73</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>262</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 3: The most common sites of injuries among the victims

Figure 1. Photomicrograph showing head injury with subarachnoid haemorrhage
Figure 2. Photomicrograph showing brain subdural haemorrhage.
IV. DISCUSSION

In this study, the male to female ratio of the victims was 4:1 and mean age of was 36.6±16.0 years. Similar findings were reported in Umuahia, Benin City, and Singapore. This shows that males were most affected gender in this study. Obviously, males play critical role in the families as the bread winners as well as the dominant male-driven economy in our society. However, gender ratio from Ilorin, Guinea, Pakistan and Iran were slightly lower than those of our findings with exceptionally high ratios from Saudi Arabia and Bangalore, India where the male to female ratios were 14:1 and 11.5:1 respectively. The skew towards male gender is a reflection of gender inequalities in this part of the world where most socio-cultural and economic responsibilities are shouldered by males. In Saudi Arabia, women are not allowed to take part in the religious, socio-cultural, economic and political activities in the country where most people are Muslims.

We observed that 107 (79.26%) of the victims were aged between 21 and 60 years with peak among the 21-30 years (29.63%) followed by the 31-40 (19.26%) and 41-50 year (17.78%) age groups. Similar findings were reported from Benin City, Sagamu, Port-Harcourt, Libya, Pakistan, Vietnam, India, and Jamaica. However, the most affected age groups in Guinea, China, Dhaka, Bangladesh, and Argentina were 35-49, 31-48, 31-40, 15-29 respectively. These variations may occur even within the same country. Our findings also showed that 14.81% (20) were children and the most affected age group was the 11-19 age groups. It appears that the mortality rates of the children in our study was high compared to reports from Jamaica, China, and India where children were involved in 11%, 2.8% and 4.9% respectively.

In this study, 5.18% (7) cases of the RTA victims were elders above the age of 60 years. This finding was lower than the rate of mortality among the elderly (11%) reported in China. This reflects the minimal socio-economic expectation on our elders compared to the Chinese and people in developed world.

The external injuries and fractures were observed in the Head and neck region in 103 cases (39.31%), the lower limb in 59 cases (22.51%), upper limb 37 (14.12%), chest 24 (9.16%), pelvis 9 (3.44%), abdomen and viscera 15 (5.73%) respectively. In Iran, Mohammadi et al. reported that head and neck region was involved in 69% of the victims. Similarly in Jammu, India, Khajuria et al. reported that limb injuries constituted 31.08% (189) of the total injuries, followed by injuries involving head, thorax, abdomen, pelvis and spine. The further observed that 68.85% of RTA victims had head injuries culminating in skull fractures.

The extremities were the second commonest site of injuries after the head and neck region in 103 cases (39.31%), the lower limb in 59 cases (22.51%), upper limb 37 (14.12%), chest 24 (9.16%), pelvis 9 (3.44%), abdomen and viscera 15 (5.73%) respectively. In Iran, Mohammadi et al. reported that head and neck region was involved in 69% of the victims. Similarly in Jammu, India, Khajuria et al. reported that limb injuries constituted 31.08% (189) of the total injuries, followed by injuries involving head, thorax, abdomen, pelvis and spine. The further observed that 68.85% of RTA victims had head injuries culminating in skull fractures.

We observed that the commonest cause of death was haemorrhagic shock 75 (55.56%). This resulted from extensive injuries to soft tissues and bones. This agreed with reports from

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India and Fiji. However, Eid et al. reported that haemorrhagic shock accounted for about 25% of death among RTA victims in Karnataka, India.

Head injuries constituted 53 (39.26%) of mechanism of death in this study. Most of the head injuries resulted in skull fractures with or without brain parenchymal or intracranial haemorrhage. Similar reports were made from United Arab Emirates, and India. 

Septicaemia accounted for 2.96% (4 cases) of death in this study. This is usually a complication of RTA in cases where secondary bacterial infection of wounds occurs. Similar report was made by Dileep et al. in India where 5.9% of RTA victims died following septic shock. Furthermore, exsanguinations were observed in 2.22% (3) of the victims. The major causes of exsanguinations were viscer al laceration involving the heart, lungs, decapitation and extensive soft tissue injuries with massive haemorrhoma.

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The Study of Crossover Effect of Occupational Stress on Job Satisfaction of Dual Earner Couples

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Abstract: Job satisfaction of the employee is most important factor to the successful organization. Satisfied employee is an asset to the organization. Because satisfied employees contribute with his full potentials to the organization. This study investigated the impact of crossover effect of occupational stress of spouse on job satisfaction of the employee. The organizational context of the study was a Sri Lankan Apparel Organization. The basic aim of this study is to fill the existing literature gap. To measure the level of job satisfaction of employee, researcher used validated global job satisfaction scale developed by Brayfield and Rath (1951) and Occupational stress of the spouse was measured by using validated occupational stress scale developed by Srivastav and Singh (1981). Findings of the study revealed that the occupational stress experienced by the spouse negatively impact on job satisfaction level of the employees.

Key Words: Crossover Effect, Occupational Stress, Job Satisfaction, Garment Manufacturing

1. INTRODUCTION

Background of the Study

In recent decades the work force composition has been dramatically changed. Workforce consists with male employees as well as female. Female participation also becomes higher value than previous decades. The Sri Lanka labour force survey annual report (2011) indicates that the number of women in the workforce is equal to 32.8 %. Female participation for the workforce is getting high because of the several reasons. Economic factors, social factors, education level etc. It is directly affecting to the dramatic change of life styles of dual earners who joined with workforce. Workforce demographics, family roles, and the relationships between work and family are affected by those reasons. These changes include an increasing percentage of families supported by dual incomes, widespread gender integration in organizations, and the aging of the population (Hammer, Colton, Caubet, & Brockwood, 2002). For example, the 2012 National Study of the Changing Workforce conducted by the Families and Work Institute in New York, indicates that the proportion of women and men in the workforce is now nearly equal, at 49% and 51%, respectively (Bond, Thompson, Galinsky, & Prottas, 2003). Further, 78% of married employees are members of dual-earner couples (Bond et al., 2003). It is clear that the more employees are dealing with both work and family domain. And most of them are feeling difficulties with this kind of environment. Because difficult to manage family roles and work roles at a once.

Even if the dual earner careers will effects to increase economic capacity of the family, the difficulties of occupying multiple roles is higher than the benefits. Having multiple roles generate the high level of stress to the job holder.

Crossover effects involve the transmission of stress, strain, and depression from one member of a dyad to another. Effects of employees’ attitudes, stress, and burnout on spouses’ attitudes, stress, and burnout, demonstrates these important interdependent effects among dual earner couples (Shafiro, 2005). Crossover denotes the process in which stress and strain experienced by employees leads to stress and strain experienced by their spouses at home (Westman, 2001). Demerouti, Bakker and Schaufeli (2005) noted that spillover concerns an intra-individual transmission of stress or strain from one domain to another domain, while crossover refers to a dyadic, inter-individual transmission within the same domain.

Research Problem

Due to changed values on women and men’s roles in society, traditional family models have been steadily replaced by more egalitarian partnership constellations. Women’s roles are no longer confined to family and home-keeper roles, and men are no longer the sole breadwinners in the family (Abele & Volmer, 2011). Over recent decades, a body of research has accumulated to indicate that job stressors can have a negative impact on health. Several studies have reported that work stress may be linked to reduced levels of psychological well-being, not only for the individual, but also for his or her life partner (Crossfield, Kinman, & Jones, 2005). According to the previous researchers, various terms have been utilized to describe this phenomenon as
Negative spillover; Carryover; Contagion of stress; Stress transmission; and Stress transference. In recent years, the term “crossover” has become more commonly used (Westman, 2002). The process that occurs when a stressor or psychological strain experienced by one person affects the level of strain of another person is referred to as crossover (Westman, 2001). Crossover is a dyadic, inter-individual transmission of well-being between closely related individuals that occurs within a particular domain such as the workplace or the family (Bakker, 2007).

Early studies of stress crossover focused on the relationship between the demands of a male worker’s job and the resulting psychological strain for his wife or cohabiting partner (Crossfield, Kinman, & Jones, 2005). Direct stress crossover is indicated by a correlation between the stress reported by one person and the strain indicated by another (Song, Foo, Uy, & Sun, 2011). The crossover process should be further investigated in couples where male and female partners have working roles of equivalent status, where they are likely to experience workplace stressors that are similar in nature and degree (Crossfield, Kinman, & Jones, 2005).

Job satisfaction can simply be defined as how people feel about their jobs. It is the attitude that an individual carries towards a job, also known as the general disposition towards a job. It can be defined as a pleasurable (or unpleasurable) emotional state because of the appraisal of one’s job, an affective reaction to one’s job, and an attitude a person carries towards his job. (Bajpai, Dave, & Bajpai, 2015). According to the Salim and Haq (2015) job satisfaction is a synchronization of what an organization requires of its employees and what the employees are seeking of the organization. Countless studies have been conducted examining the effects of job satisfaction on important workplace attitudes and behaviors of employees. Satisfied employee is a productive employee (Salim & Haq, 2015). Job satisfaction relates to employee’s personal evaluation of jobs against those issues that are essentially considerable to them. As emotions and feelings are involved in Such assessments, employees’ levels of job satisfaction may impact significantly on their personal, social and work lives, and as such, also influence their behavior at work, (Sempane, Rieger & Roodt, 2002).

Job satisfaction level can be judge on various parameters. It is leadership, supervision, compensation, recognition, employee’s role, work climate, team work, job security, job content, technology suggestions, training and development, company image, facilities, advancement opportunities, role clarity, performance appraisal system, employee’s suggestion (Salim & Haq, 2015). When we considering past researcher’s findings they have find out that several factors affecting on job satisfaction of the employees. Lawrence (2005) listed down the following ten representatives for job satisfaction: type of work, job security, company, advancement, coworkers, pay, supervision, hours, benefits & working conditions. Job satisfaction is the result of effect of so many factors. The terms are highly personalized, as the level of satisfaction differs from time to time and situation. Moreover, the attitude of any employee affects a lot. One gets satisfaction in any of the activities depending upon how he/she perceives the situation and what is expected in exchange of effort. There may be the difference between two employees, working at a different place and on different cadres. It all depends upon viewing of the situation and the effect of rest of the factors which are crucial at any point of time (Salim & Haq, 2015).

Ouyang, Sang, Li and Peng (2014) revealed that emotional intelligence, organizational justice, job insecurity and job satisfaction were significantly correlated with each other. Structural equation modeling indicated that emotional intelligence can significantly influence job satisfaction and the relationship between EI and satisfaction was partially mediated by organizational justice and job insecurity. Skogstad, Aasaland, Nielsen, Hetland, Matthiesen and Einarsen, (2014) found that there is a relationship between leadership styles and job satisfaction. Okwaraji and Aguwa (2015) reported that job satisfaction was negatively affected by psychological distress and burnout especially the emotional exhaustion component of burnout. In other hand Adenuga, (2015) found that there is significant relationship in the occupational stress and job satisfaction.

According to above literature it shows that the direct factor effecting on job satisfaction of the employee. However none of those studies have investigated the impact of indirect factor on job satisfaction like crossover of occupational stress. Hence researcher attempt to find out the impact of occupational stress experienced by spouse on job satisfaction of employee. Thus research problem that need to be find answer through this study is,

**Does the crossover of occupational stress in dual earner careers have an impact on their job satisfaction?**

**Hypothesis**

$H_1$: There is a significant impact of occupational stress level of spouse on job satisfaction of employees.

**Objective of the Study**

To identified the impact of crossover of occupational stress on job satisfaction of employees.
2. LITERATURE REVIEW

Occupational Stress

The stress is a burning issue in modern society. The effect of stress is a deviation from the existing physical and psychological condition of human life (Fernando, 2007) Stress is considered to be one of the main themes in the research for last two decades and a significant growth observe in researchers’ interest as a concern to both employers and employees (Hochwarter, Perrew, Meurs & Kacmar; Cartwright, as cited in Rahim, 2010).

Luthans (2000) has explained that stress is usually thought of negative terms. It is thought to be caused by something bad which harmfully impacts the human lives, including workers. According to the Nelson and Quick as cited in Fernando (2007) stress is an important topic in organizational behavior, in part due to the increase in competitive pressures that take a toll on workers and manager alike.

“Occupational stress is defined as the harmful physical and emotional response that occurs when job requirements do not match with the worker’s capabilities, resources and needs” (National Institute of Occupational Safety and Health).

Sel耶 as cited in Jayasheer, (n.d) defines stress as “a dynamic activity where in an individual is confronted with an opportunity, constraint or demand”. Organizational stress arises due to lack of person-environment fit. Stress is a term in psychology and biology borrowed from physics and engineering and first used in the biological context in 1930s. Work related stress is the response people may have when presented with work demands and pressures that are not matched to their knowledge and abilities and which challenge their ability to cope (Rao & Borkar, 2012). According to the National Institute of Occupational Safety and Health (1999) Work stress is defined as the harmful physical and emotional responses that occur when job requirements do not match the worker’s capabilities, resources, and needs. Weerasinghe and Batagoda. (n.d) indicated that job stress is considered as the harmful physical and emotional response that occurs when there is a poor match between job demand and capabilities resources and need of employees. Beehr and Newman (as cited in Malik, 2011) define occupational stress as "A condition arising from the interaction of people and their jobs and characterized by changes within people that force them to deviate from their normal functioning."

The occupational stress should not be considered as a problem of an organization alone. In general, an economy and a society consist of so many socio and economic institutions. These institutions are inter-related in nature. Hence, it should be understood that if the stress of an individual worker not only affects the institution or organization but also other institutions and organization of an economy as well (Fernando, 2007). Steers (as cited in Jayasheer, n.d) indicate that, “Occupational stress has become an important topic for study of organizational behavior for several reasons.” 1. Stress has harmful psychological and physiological effects on employees, 2. Stress is a major cause of employee turnover and absenteeism, 3. Stress experienced by one employee can affect the safety of other employees, 4. By controlling dysfunctional stress, individual and organization can be managed more effectively.

Cartwright and Cooper as cited in Rehman, Khan, Afzal, Akhter, & Ali, (2010) further pointed out that in the short term stress can lead the employees to stomach disorder, headaches, sleeplessness, emotional distress and loss of energy/motivation, and in the long term it can result in serious illness and even early death, most likely due to cardiovascular disease (heart diseases). Furthermore, job stress appears to be endemic to the current workplace. Palmer et al (as cited in Park, 2007) suggest that stressed workers are also more likely to be unhealthy, poorly motivated, less productive and less safe at work. And their organizations are less likely to succeed in a competitive market. By some estimates work-related stress costs the national economy a staggering amount in sick pay, lost productivity, and health care and litigation costs.

Malik, (2011) argued that Stress can undermine the achievement of goals, both for individuals and for organizations. If key staff and large number of workers are affected, work stress may challenge the healthiness and performance of their organization. Furthermore Malik, (2011) has explained that Unhealthy organizations do not get the best from their workers and this may affect not only their performance in the increasingly competitive market but eventually even their survival. Moreover Leka (as cited in Malik, 2011) indicated that consequences of occupational stress under following two categories. When affected by work stress people may: become increasingly distressed and irritable, become unable to relax or concentrate, have difficulty thinking logically and making decision, enjoy their work less and feel less committed, feel tired, depressed, and anxious, have difficulty sleeping, experience serious physical problem such as heart disease, increases in blood pressure and headaches.

There are number of workplace factors, called job stressors that make jobs stressful and difficult for number of employees in services as well as manufacturing industries. Additional stressors concern interpersonal relationships at work, such as conflicts with the behavior of supervisors, conflicts with colleagues, conflicts with subordinates and conflicts with management policies (Paul, Kahn, Byosiere, Taylor and Paul as cited in Rehman, Khan, Afzal, Akhter, & Ali, 2010). Rehman, Khan, Afzal, Akhter, and Ali, (2010) further pointed out that there are some other stressors in the organizational context, such as having insufficient resources to do the job (e.g., defective equipment or inadequate supplies), or low salaries structure.
People react to stress in different ways. Some coping is much better than others and suffering fewer of the harmful effects of stress. Just as stress differs as a function of the individual, it also differs as a function of one’s type of occupation. Some occupations are, of course, inherently more stressful than others. All of the stress-strain-health relationships have an obvious impact on the organization and industry. Occupational stress is becoming increasingly globalized and affects all countries, all professions and all categories of workers, as well as families and society in general Ahmad and Ahmad (as cited in Malik, 2011).

Crossover Effect

The process that occurs when a stressor or psychological strain experienced by one person affects the level of strain of another person is referred to as Crossover. Westman (as cited in Schaufeli, Bakker, & Demerouti, 2005). Besides Bakker (2012) define that crossover as job strain experienced by an individual may lead to strain being experienced by the individual’s partner at home. For example, a person who feels chronically fatigued and has become cynical about the meaning of work may transfer such feelings and attitudes to the partner during conversations at home.

Similarly Schaufeli, Bakker, & Demerouti (2005) indicated that Crossover is a dyadic, inter-individual transmission of stress or strain that occurs within a particular domain such as the workplace or the family. In examining the stress crossover Westman (as cited in Song, Foo, Uy, & Sun, 2011) define Crossover is the transfer of affective experiences across individuals. Song, Foo, Uy, & Sun, (n.d) explain that Crossover effects depict a dyadic process whereby each spouse transmits and catches the effect of the other spouse. In a typical weekday, crossover is likely to happen at home either in the early morning or in the evening when couples interact with each other. Because work is an important life domain, stress at work can carry over to the family domain, (Song, Foo, Uy, & Sun, 2011)

When we considering the previous research studies various models are proposed to explain stress crossover, more specifically Westman (as cited in Bakker, 2012) has suggested several possible mechanisms to explain the crossover process. First, direct crossover can take place between the two spouses or partners through empathic processes. That is, because spouses/partners spend considerable time together, they become aware of and are affected by each other’s affective states. Second, the spouses/ partners may share some common stressors (e.g., financial pressures, life events) that can lead to increased levels of common strains (e.g., negative affect). Third, crossover may be an indirect process. That is, there is an indirect crossover of strain mediated by the communication and interaction of the spouses/partners (e.g., coping strategies, social undermining, and lack of social support).

When focused early studies of stress crossover Jackson and Maslach (as cited in Crossfield, Kinman, & Jones, 2005) investigated that crossover of stress from police officers to their wives, and found that officers with high levels of stress were more likely to display anger, spend time away from home and be less involved in family life. Their wives demonstrated a corresponding increase in distress and dissatisfaction with their marital relationships. Similarly, Long and Voges (as cited in Crossfield, Kinman, & Jones 2005) also indicated that demands of prison officers’ jobs, in particular the violent nature of the work, adversely affected their wives” psychological well-being.

Most studies have investigated and found evidence for the crossover of psychological strains such as anxiety, burnout, distress, depression, and marital dissatisfaction. And also studies have detected direct crossover of positive experiences, like work engagement life satisfaction and vigor. A few studies investigated crossover of health complaints and perceived health between partners. However, less attention has been paid to investigate the impact of occupational stress crossover on job satisfaction. Here researcher trying to evaluate the impact of occupational stress crossover on job satisfaction.

Job Satisfaction

Job satisfaction refers to employees’ attitudes or opinions toward the job itself or the relevant environment and to their overall emotional response to their job roles Brayfield & Rothe (as cited in Ouyang, Sang, Li, & Peng, 2014). Also Robin (as cited in Adenuga, 2015) defined job satisfaction as a general attitude towards an individual’s job, and the difference between the amount of reward workers receive and the amount they believe they should receive. Bajpai, Dave, & Bajpai, (2015) says that Job satisfaction can simply be defined as how people feel about their jobs. It is the attitude that an individual carries towards a job, also known as the general disposition towards a job. It can be defined as a pleasurable (or unpleasurable) emotional state because of the appraisal of one’s job, an affective reaction to one’s job, and an attitude a person carries towards his job.

Cranney, Smith, & Stone (as cited in Fields, 2013) Job satisfaction is generally defined as an employee's affective reactions to a job based on comparing actual outcomes with desired outcomes. Moreover Hoppock (as cited in Salim & Haq, 2015) argued that job satisfaction depends upon the extent to which the job, we hold meets the needs that we feel it should meet. The degree of satisfaction is determined by the ratio between what we have and what we want. According to the Salim & Haq, (2015) Job satisfaction level can be judge on various parameters. It is leadership, supervision, compensation, recognition, employee’s role, work climate, team work, job security, job content,
Finally we can create an argument as Job satisfaction is the result of so many factors. The terms are highly personalized, as the level of satisfaction differs from time to time and situation. (Salim & Haq, 2015). Furthermore Okwaraji & Aguwa, (2015) have explored that Job satisfaction has to do with the positive orientation of an individual towards his or her work. Variables like pay, promotion, working conditions, leadership, social relationships and the job itself were said to influence the level of job satisfaction an individual derives from his or her work.

According to the literature different studies were conducted by researchers in different contexts regarding job satisfaction. Al-Zubi, (2010) was conducted a research study to investigate the relationship between Organizational Justice and Job Satisfaction. The findings also suggested that this was positive association organizational justice and job satisfaction. Employee job satisfaction depends upon the organizational justice of managers. Adenuga,(2015) was found that there is significant relationship in the occupational stress and job satisfaction of bank employees according to the results of the study on Impact of Occupational Stress on Job Satisfaction and Mental Health of First Bank Employees. And it was further revealed that occupational stress predicted job satisfaction and mental health. Based on the findings, it was suggested that mental health and job satisfaction of the bank employees be given greater attention. On the other hand aspects of the work situation have been shown to be determinants of job satisfaction. For example, a broad situational factor job level is positively correlated with satisfaction with all aspects of the job probably because higher-level jobs tend to have better working conditions, pay, promotion prospects, supervision, autonomy, and responsibility (Robie, Ryan, Schmieder, Parra, & Smith, as cited in Fields, 2013).

A qualitative study (Bussing, Bissels, Fuchs, & Perrar,as cited in Fields, 2013) suggested that job satisfaction is developed through assessment of the match among expectations, needs, motives, and the work situation. Based on this assessment, a person builds up satisfaction (steady feeling of relaxation as a result of met expectations and needs) or dissatisfaction (feeling of tension as a result of unsatisfied needs and expectations) with her or his work. Under the concept of job satisfaction, several studies were done through analyzing relationship of job satisfaction with organizational commitment, burnout, and occupational stress too. Most previous studies have focused on occupational characteristics, including income, job characteristics, work–family conflict, stress, and leadership (Judge, Piccolo, Podsakoff, Shaw, & Rich, 2010). Although none of the studies have been done to investigate the relationship between crossover of occupational stress and job satisfaction regarding executive level employees in Sri Lankan context. Therefore the aim of the present study is to explore the relationship between crossover of occupational stress and job satisfaction based on the sample executive employees.

3. METHODOLOGY

Conceptual Framework

The research consists with both primary and secondary data. The primary data was collected through self-administrated questionnaire to assess the crossover of occupational stress on job satisfactions of executive level employees. The secondary data was collected through the cadre reports. The total number of married, dual earner executive level employees working was considered as total population. The sample frame consists with 53 executive level employees including merchandisers, fabric technologists, garment technologists, supply chain executives, HR & Finance executives. Theoretically, move in to sampling is suitable if there is a too large population. Since the particular population was not too much large conducting a Census without doing sampling, resulted an error free sample and ensured the generalization. Therefore researcher studies all the 53 executive level employees in this study to collect the data. Each couple received two identical sets of questionnaires, marked as employee Questionnaire and partner questionnaire, together with an instruction sheet asking them to complete their questionnaires independently without consulting their partner. All questionnaires were anonymous, but number coded in order to allow each couple’s questionnaires to be matched.

Dependent variable of the study; Job Satisfaction was measured through M&S employee questionnaire. It was conducted through job satisfaction global scale developed by Brayfield and Rath (as cited in Hoole & Wermeulem 2003). This Global job satisfaction scales were designed to assess employees’ overall job satisfaction; rather than job satisfaction with facets of the job and was used to measure the job satisfaction in vide variety of jobs. Among global job satisfaction measures the Overall Job Satisfaction Scale (OJS; Brayfield & Rothe, 1951) seems to be the most popular and the most comprehensive scale for measuring OJS. Reliability value of the original questionnaire in previous study...
was 0.87. The measurement scale consists with 17 items including 4 reverse coded items numbered as 6, 11, 14, and 26 in analyzing part values of these questions also will be revised.

The partner questionnaire is used to measure the independent variable occupational stress and it was measured by Occupational stress index developed by Srivastav and Singh (as sited in Puri 2011). The scale measured the extent of occupational stress on employee under 12 relevant components of the job life which case stress as role overload, role ambiguity, role conflict, unreasonable group and political pressure, responsibility for person, under participation, powerlessness, poor peer relations, powerlessness, poor peer relations, intrinsic improvement, low states, strenuous working conditions, and unprofitability through 25 questions. The reliability Cronbach alpha coefficient for the original scale as a whole is found to be 0.935 and validity is found to be 0.89. Partner questionnaire consists 8 reverse coded items from question 12 to 15, 17, 18, 20 and 23 in analyzing part values of these questions will be revised. The researcher has modified standard questionnaires to fit the context with five point Likert scale for both Occupational stress and Job satisfaction.

4. DATA PRESENTATION, ANALYSIS AND DISCUSSION

The total sample consists, 60% males and 40% female respondents. The highest respondent percentage is on male category. The table presents that the percentages of the respondents categorized by Age. Under the four main ranges respondents distributed as 11%, 36%, 28% and 25% for the age of respondents, for less than 25 years, between 25-35 years, 36-45 years and more than 45 years respectively. The highest respondents’ percentage comes under the age range between 25-35 years as 36%. The lowest is under the age range below 25 years. Sample composition of the departments shows 23% respondents are in kids wear, as same as the women’s wear departments comprise with 23% respondents as the highest. Menswear, lingerie, fabric and other department have 19%, 11%, 13%, and 11% respondents’ percentage respectively. Other department category includes the departments of Human Resource, IT, Admin, and finance. When considering the each department percentage the highest respondents are in kids wear and Women’s wear departments. Considering the educational level indicated on the table, majority of respondents (50.9%) were belongs to the graduate level. 24.5% respondents were belongs to the both of diploma and master educational level. However no any of responder found to be categorized under the A/L category. Most of the respondents (36%) have work experience between 1-5 years and 32% of the respondents have work experience between 6-10 years. There are fewer amounts of respondents have more than 10 year and below 1 year experience as 21% and 11% respectively.

Reliability Analysis

The standard questionnaire was used for the present study has the reliability value of 0.935 and 0.87 for occupational stress and JS respectively. Reliability of the measurement has been tested by using Cronbach’s alpha.

Correlation Analysis

The correlation coefficient is measures the strength of the association between any two metric variables (Hair et al., as cited in field, 2009). Since the significant values (P value) appear 0.000 and less than the 0.05, the variables were significant at 95% confidence level. According to the results of the correlation matrix the dependent variable and the independent variables were negatively correlated to each other by - 0.639. There was a high degree of negative correlation (0.5 < r < 0.75) between occupational stress of partner and job satisfaction (-0.639).

Table 1: Correlation Analysis

<table>
<thead>
<tr>
<th>Job Satisfaction</th>
<th>Correlation Value</th>
<th>Occupational Stress of Partner</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>-0.639</td>
</tr>
<tr>
<td>P Value</td>
<td></td>
<td>0.000</td>
</tr>
</tbody>
</table>

Regression Analysis

Since the occupational stress of spouse were correlated with dependent variable simple regression analysis was used to measure the impact of the independent variable on dependent variable.

Coefficient of Determination (R2) indicates that how well data points fit a line or curve. The result should be in range between 0 to 1 (Field, 2009).

Table 2: Model Summary
Table 2 shows the model summary of regression analysis. Value of the explanatory power ($R^2$) shows the degree to which extent the variance of the dependent variable is explained by independent variables looking at $R^2$, it can be concluded that, 40.8% (0.408) of the variance of employee job satisfaction is explained by occupational stress level of their partner. But 59.2% of the variance of employee job satisfaction is explained by other influencing factors which are not covered by the current study.

Analysis of Variance (ANOVA)

ANOVA is used to test the significance of the model. According to Field (2009) if the $P$ value is less than 0.05 ($P$ value < 0.05) the model is significance relevant to the 95% of confident level.

Table 3: Significance of the modal

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Regression</td>
<td>8.169</td>
<td>1</td>
<td>8.169</td>
<td>35.143</td>
</tr>
<tr>
<td></td>
<td>Residual</td>
<td>11.855</td>
<td>51</td>
<td>.232</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>20.024</td>
<td>52</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Analysis of Variance (ANOVA) test shows that the regression model is significant since the significant level is 0.000 which is less than 0.05.

Table 4: Coefficient table

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>T</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>4.331</td>
<td>0.265</td>
<td>16.697</td>
<td>.000</td>
</tr>
<tr>
<td>Occupational Stress</td>
<td>-0.511</td>
<td>0.86</td>
<td>-0.639</td>
<td>-5.928</td>
</tr>
</tbody>
</table>

B value of the table represents the degree to which extent the dependent variable can be affected by a certain independent variable while other independent variables remain constant.

Analyzing the B coefficient of occupational stress of partner, it can be concluded as, occupational stress of spouse increases by 1 unit effect to decrease the expected job satisfaction of M&S employee by 0.511 units and vice versa. Anyhow, this conclusion can be done with 95% confidence level since the significant level is 0.000.

According to the result of the coefficient table the regression equation can be create as follows.

Ex: $Y/x_1 = \beta_0 + \beta_1X_1$

Job satisfaction = 4.43 - 0.511 Occupational stress of spouse

4.2.5 Hypotheses Testing

Hypotheses can be tested by using the $P$ - value (sig level) of each B coefficient of independent variables. Confident interval of accepting hypotheses in social sciences is 95%. To achieve this confident interval, $P$ - value should be equal to or less than 0.05. If it is not equal to or less than 0.05, null hypotheses cannot be rejected. In another way alternate hypothesis is not supported.

$P$ - Value of the B coefficient of occupational stress of the partner is 0.000 which denotes that occupational stress of partner effect on Job satisfaction of employee with 0.000 significant level which is lower than 0.05. Since the $P$ – value
is lower than the recommended level, $H_1$ is accepted. Thus it can be concluded as, Occupational stress of partner significantly effect on Job satisfaction of employee.

Discussion

The purpose of this research was to examine the effect of crossover of occupational stress to job satisfaction, among employees in M&S SLRO. Research objectives were stated to find out the effect of occupational stress level of spouse on job satisfaction of M&S SLRO employees. Job satisfaction was measured by using global job satisfaction scale developed by Brayfield & Rothe (1951). Here occupational stress was considered as uni-dimensional concept and it was measured under 12 indicators as Role overload, Role conflict, Role ambiguity, Unreasonable group and political pressure, Responsibility for person, Under participation, Powerlessness, Poor peer relations, Intrinsic improvement, Low status, Strenuous working conditions, Unprofitability. Occupational stress was measured by Occupational stress index developed by Srivastav and Singh (1981). According to the findings of the study it shows that there is a significant correlation between crossover of occupational stress and job satisfaction of M&S SLRO employees. The correlation coefficients are the measure of the strength of the association between any two metric variables (Hair et al., as cited in field, 2009). Results of the study show that there was a high degree of negative correlation ($0.5 < r < 0.75$) between occupational stress of partner and job satisfaction. It shows that the correlation between crossover of occupational stress and job satisfaction of M & S SLRO employees equal to -0.639. Since the significant values appear 0.000 and less than the 0.05 (P value), the variables were significant at 95% confidence level. In addition to that the regression analysis exhibit (by R2 value) that the occupational stress level experienced by the partner explained the job satisfaction of M & S SLRO employees by 40.8% and rest of the 59.2% was impact by the other factors and those other factors are not covered under this study.

According to the results of the hypotheses testing it was empirically proved that there was a negative impact of occupational stress of spouse on job satisfaction of M&S SLRO employees. It indicated that the higher level of occupational stress of spouse cause to decrease the level of job satisfaction of the employee. Number of previous researchers found out that OS can negatively contribute to the job satisfaction of employee. Adenugia, (2015) was found that there is significant relationship in the occupational stress and job satisfaction of bank employees based on the study conducted to measure the impact of Occupational Stress on Job Satisfaction and Mental Health of First Bank Employees. Furthermore Bajpai, Dave, & Bajpai, (2015) found that job stress has an negative impact on determination of the level of job satisfaction from the study of impact of work stress on job satisfaction of employees working in Indian banking sector. But none of the previous research studies tried to find out the impact of crossover of occupational stress on job satisfaction of employee. Based on the findings of the present study it can be proved that the crossover of occupational stress has an impact on job satisfaction of dual earner employees.

5. CONCLUSION

The study was carried out with the purpose to inspect the impact of occupational stress of spouse on degree of job satisfaction of executive level employees in M&S SLRO. The tested model take occupational stress of spouse as the independent variable while job satisfaction of M&S SLRO as the dependent variable. All the executive level employees recognized under dual earner category, working at M&S SLRO were taken for the study as the sample. For collecting data researcher distributed two questionnaire named as M&S Employee questionnaire and Partner questionnaire. M&S employee questionnaire used to collect the data from M&S SLRO employees, relevant to the level of job satisfaction of employees. Meanwhile researcher used the Partner questionnaire to collect the data relevant to the occupational stress level of spouse. Researcher distributed these coded two questionnaires with instructed them to answer the questionnaire independently without consulting to each other. According to the results the sample distribution was approximately equal for male employees as same as, female employees; contributing to the workforce from considerable amount (40% from the sample). It was proved that the Sri Lankan workforce composition comprised with considerable amount of female participation. And it was proved that the respondents of the sample were educated and young. According to the statistical analysis of the study it shows that occupational stress experienced by the spouse negatively impact on job satisfaction level of M&S SLRO employees. Considering the correlation coefficient results of the study it indicated that there is a negative relationship between the occupational stress experienced by the spouse and job satisfaction level of M&S SLRO employees. Furthermore the result of regression analysis also shows that the occupational stress experienced by spouse negatively impact on job satisfaction of M&S SLRO employee by -0.511. Finally we can arrive a conclusion, based on the study as crossover of occupational stress negatively impact on job satisfaction of M&S SLRO employees.
LIST OF REFERENCE


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Child Labour and Academic Performance of Junior Secondary School (JSS III) Students in Ogoja Education Zone of Cross River State, Nigeria

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Abstract - The study investigated the relationship between child labour and academic performance among Junior Secondary School (JSS III) students in Ogoja education zone of Cross River State. Ex post-Facto research design was adopted. A 30-item questionnaire and a 40-item achievement test were the instruments used to gather data for the study. Simple sampling technique method was applied. Six hundred and ten (610) students were randomly selected from the 74 public secondary schools in the zone using two schools each from a Local Government Area in the zone for the study. Data gathered were subjected to Pearson Product Moment Correlation Coefficient. The result of the analysis revealed negative significant relationship between child labour, and academic performance of upper basic students in Ogoja education zone of Cross River State. Based on the above findings, it is strongly established that students who are victims of one forms of abuse or the other, are likely to perform poorly academically.

Index Terms - Child labour, Academic performance, Students, and junior secondary school.

I. INTRODUCTION

According to Pinzo and Hofferth, (2008) child labour is a far reaching and complex problem in developing countries. It has existed in various forms (force labour, trafficking and street trading) in different parts of the world since ancient time. The types of child labour vary according to the country’s culture, and family culture, rural or urban residency, socio-economic condition and existing level of development among other factors. A survey by Global March (2008) state that child labour emerged as an issue during the industrial revolution when children were forced to work in dangerous conditions for well up to 12 hours in a day. In 1860, 50% of children in England between the ages of 5 and 15 were said to be working. However, 1919 saw the world systemically begin to address the issue of child labour and the international labour organization (ILO) adopted standards to eliminate it. Throughout the 20th century, a number of legally binding agreements and international conventions were adopted but despite all this, child labour continues to this day. The highest number of child labourers are said to be in the Asia-Pacific region, but the largest percentage of children, as proportion of the child population, is evidently found in sub-Saharan Africa with Nigeria (Cross River State) having a fair share.

The word child labour is any form of physical, psychological, social, emotional and sexual maltreatment of a child whereby the survival, safety, self-esteem, growth and development of the child are endangered. Herrenkohl, (2005) and Psachropoulos, (2007) view child labour as a disinvestment of social and human capital, a compromising of the development of the individual, and a hindering of the development of skills, abilities, and knowledge necessary to make significant contribution to society. Convention on the rights of the child CRC, (2002) described child labour as paid and unpaid work that occurs in any sector, including domestic, and agricultural sectors, that are harmful to children’s mental, physical, social or moral development of the child in the modern society; any work that deprives children opportunity to attend school, obliges them to leave school permanently or requires them to attempt to combine school attendance with excessively long and heavy work is categorized as child labour. The Article I of the United Nations convention on the Rights of the child, defines a child as any one below the age of 18. Child labour does not only exist in the impoverished areas of developing countries, but also flourish in other developed nations. Though, it is a complex problem in developing countries.

Child labour remains a major source of concern in Nigeria, in spite of legislative measure taken by the government at various levels. In 1998, a report from the International Labour Organization (ILO) estimated that 24.6% of children between the ages 10-14 in Nigeria were working (World Development Indicator 2000). Earlier before that time in 1994, the United Nations children’s Emergency Fund (UNICEF) reported that approximately 24 percent (12 million) of all children under the age of 15 worked (UNICEF, 2005). It is a ridiculous sight in most big cities, as well as rural villages today to see children of school age, trading food on the street, herding animals, tanning and drying raw leather product, fetching water for commercial purpose, washing dishes at restaurants, serving as domestic hands, selling wares at kiosks, collecting firewood for business, harvesting crops in family farm or commercial plantation amongst other activities (Thomberry 2013), agreement with the labour abuse (child labour) trend, the International Labour Organization (2002) in it other report issued, states that the global figure of child labourers was put at appropriately 250 million. The report adds that the ages of the children range between 4-14 years with 120 million of them working full time.

According to Robinson (2009) the phenomenon of child labour is arguably the tallest challenges that impacts directly on school enrolment, attendance, academic performance, completion...
rates as well as health rest, leisure and the general psychological disposition of children. As stated earlier, child labour takes various forms such as street trading, gardening, child caring, handicrafts, house chores, prostitutions and trafficking etc., there all have implication on the learners level of commitment.

Obinaju, (2005) tried specifically to look at child work in a more detailed way, in the perspective of culture. To the author, child labour covers tasks and activities that are undertaken by children to assist their parents or guardians. In particular, such jobs as cooking, washing dishes, planting, harvesting crops, fetching water and firewood, herding cattle, and babysitting. In this case child labour simply aims at tasks and activities which are geared towards the socialization process, if education must be wholesome.

However, the International Labour Organization (ILO), in it condemnation, said, child labour is as stipulated hereunder: children prematurely leading adult lives, normally working long hours for low wages under conditions damaging to their health and to their physical and mental development, sometimes separated from their families, frequently deprived of meaningful educational training opportunities that could open for them a better future. International Labour Organization (2001), in a study entitled “focusing on the worst forms of child labour in Tanzanian says child labour refers to work carried out to the detriment and endangerment of the child, mentally, physically, socially and morally. Child labour is generally interpreted as “all cases in which children are exposed to harm at work whether or not children are less than 14 years old or less” (UNICEF, 2005). The meanings and implications of child labour have been highly dependent on it social, cultural and economic context as well as missions, strategies, and objectives of each organization. Two of the major international organizations traditionally working on behalf of child labour issues, the International Labour Organization (ILO) and United Nations Education and Scientific Organization (UNESCO) had utilized quite different child labour concepts and categorization until at least the early 1990s. Trade unions and ILO often used “child labour” and child laborer” instead of “working children” implying that children should be kept away from the labour force at least until they reach a minimum working age on the basis of the fact that this organizations historically tended to protect and secure adult labour market.

Scanlon, (2002) conversely, referred to “child labour” according to articles 32 of the conventions on the rights of the child, in which child labour includes any economic activities impeding or hindering the child’s full development or education. UNICEF described child labour as work that violates children’s human rights (Post, 2001).

The international labour organization categorized child labour as follows.

i Agricultural labourers.
ii Domestic labourers.
iii Street labourers and
iv Factory labourers with wages.

Golden and Prather (2009) claim that “child labour” is exploitative, as the latter potentially impairs the health and development of the children. By contrast, James and James (2008) although agencies such as ILO, and UNICEF working on child labour issues originally had different concepts on child labour, following the establishment of the worst form of labour convention 182 in 1999 as well as inter-agency research cooperation such as understanding children’s work in 2000, a growing consensus has emerged that child labour refers to unacceptable forms of child work.

According to UNICEF (2005) the current official definitions of child labour involves as follows:

1. Child work or children’s work is a general term covering the entire spectrum of work and related tasks performed by children.
2. Child labour refers to the subset of children’s work that is injurious to children and that should be targeted for elimination.
3. Hazardous work refers to physical, psychological or sexual abuse.
4. (unconditional) worst form of child labour includes “children of any age below 18 who are involved in forms of slavery and force labour, including forced recruitment for use in armed conflicts, commercial sexual exploitation (prostitution or pornography), illicit activities (particularly the production or trafficking of drugs) and hazardous work that jeopardizes their lives, health or moral”.

On the other hand, the international labour organization’s official defines child labour in the following categories.

1. In ages 5-11 = all children at work in economic activity.
2. In ages 12-14 = all children at work in economic activity minus those in light work.

The South Asian Coalition on child servitude, (SACCS, 2003) in its perspectives defined “labour as a set up where an employee (labour) sells his or her labour to an employer with certain work related conditions, such as wages, amenities bargaining power, rights and legal safe-guards. It implies that not all work performed by children can be termed child labour. In some studies like Aderinto, (2000) children labourer are regarded as “street children” or “children of the street” who run away from parental or guardian abused, leaving them to eke out a living on other. This name “street children paralyzed them from thinking ahead, thus rendering them educationally useless and hopeless. Teichman, (2000). States that most times they go through physical and health consequences such as respiratory problems, injuries accidents, physical and sexual abuse such as rape and molestation malnourishment, extortion of income, police harassment, and participation in harmful delinquent activities all inimical to educational successes. In other studies, by (Charles and Charles, 2004) child labourers face robbery, inadequate sleep due to fatigue and long hour job, and confinement in juvenile hondes. Most times they suffer from mental related sickness such as; stigmatization from the press and public, feelings of disheartenment, stress and irritability, personality disorders, and anti-social behaviour, and alienation and isolation from their family and these have significant negative effect upon the level of education, school attendance, academic performance, grade,
literacy, leisure time, and overall human capital formation of the child worker.

The general notion held by many is that child labour, is detrimental to learners academic capability, however, some opinions differ regarding “when and how” a particular work is to be truly regarded as harmful to the future of a child or even interferes with his wellbeing. There is an argument of relativism in this discourse. A possible interpretation in this regard is to look at it in terms of opportunity cost” (gains and foregone alternatives). From this purview, a particular work would be harmful if it entails an opportunity cost in terms of other activities that are beneficial for the child and his development with reference to safety, nutrition, study, morality, leisure, rest (Okafor, 2010). This school of thought believes and sees child labour as an inevitable process of growth, development and integration of the child as stated in the social theory above. Nevertheless, the adverse consequences of child labour differ by whether they are oriented toward market or home production, as well as whether they are inside or outside the home. Therefore, the question should be child time allocation to work activities by where they occure (inside or outside household) by whether or not they are related to a family enterprise.

For Rosati and Rossi (2003), attending school and working are decision that are usually considered simultaneously as a family conversely, these authors also posit that the number of hours the child devote to work is one of the fundamental variables for evaluating the child wellbeing. Added researches in developing countries have found that the majority of child and youth labourers regularly attend school. However, in certain cases, a negative relationship between the number of hours worked and the hours of school attendance has been found (Boozer and Suri, 2001).

Buonomo (2011) found that children who work below the medium predicted by the proposed statistical model (up to two hours daily) demonstrated better school results (measured years in school, age grade ratio, completion of elementary education, completion of at least one year secondary education) than those children who only attend school. This finding indicates that while there is clear evidence of the negative impact of labour on the minor education, a minimal devotion to labour does not seem to have a significant effect on the education of children and youth. However, attendance is an indication that does not sufficiently explain the impact of child labour, as it does not take into account the quality of the child’s experience in school. Main while, majority cases, child labour makes adequate child and youth inclusion in the educational system difficult. (Grootaert and Kanbur, 2005). Dyer (2007) observes that, given that the time for work takes away from the time allocated to studies and that the attention to academic activities is reduced, due to the fatigue produced by the labour.

One of the major adverse trends in child labour is the proliferation of young conductors in the transport industry. Horsch, (2002) state that most victims work in public place such as street, markets which does not give them time to go to school and perform excellently this is mostly affected by students in secondary school. All in all, child labour seems to have a clear negative effect on academic performance.

Ukwu, (2001) estimate on child labour in Nigeria in general and Cross River State in particular, indicate that 20 percent of children between the ages of 10 and 14 involved in street trading on cheap articles, edible and products such as sachet water, plantain chips, bread, biscuit, okpa, ugba, fruits, vegetable, wears and newspapers in the streets and along the road especially at damaged portions of the roads where motorist and other road users are constrained to slow down due to bad condition of such roads. Bonded labour which is also known as debt bondage is another form of child labour suffered by most youths at the current generation (Sebre, 2004).

Child labour, also according to Okafor, (2010) exists in the form of house help or domestic servants. In this case, privilege people from the cities easily convince poor rural parents to hand in their children to them with various promises of better life and education. However, these children are sooner than later turned into house helps who cook food, wash clothes, care for babies, fetch water and attend to all sorts of household chores etc. “Children in domestic service in Nigeria can be in several forms. Firstly, it may include children from other families, parents or another society employed by certain people who are believed to be wealthy and sometime of modest income. Abused children gets up very early in the morning and begins his or her work by fetching water from a nearby well, balancing the heavy jug on his or her head as he or she returns, Prepares breakfast, and serve members of household. In addition, he/she later does the remaining jobs in the evenings and late in the night (Moses, 2005). In other instances, some of the children are taken to shop and business centres/workshops, to serve for a number of years (usually between 5-7 years) with the promise to assist them establish their personal business outfit at the end of their service period. In many case such children are exploited as they are merely used and dump on the basis of one accusation or the other. This has led to the frustration of many youths who lack the adequate machinery to seek any form of redress or social safety nets to fall back on. (Nanchi and Uba 2003).

Sabate and Rayah(2011), in his assertion, comment as thus: child labour impacts negatively on the achievement or performance of basic education because it leads to high drop rates as it easy for children to be easily deceived by meager income that trickle in, into believing that leaving school to give more time and attention to their work is a better option as they will get rich faster than their peers who have to spend many years in school. This can also lead to low academic achievement/poor performance on account of which the child would be expected to repeat a grade, this can cause fear, low self-esteem/shame both on the parts of the child and parents and make them to develop certain apathy for schooling and in such cases, and drop out could be a possible consequence. In some situations, such children are considered poor and unfit for academic pursuits and the tendency is usually to pull them out of school for a certain trade or apprenticeship thereby perpetrating further abuses since many poor parents may not be willing to give them a second chance. There is trade-off by most parents between the time children spend in labour and that spent attending school and doing some school related assignment (homework). Majority of child labourers either do not attend school or skip school to various degree (Ekwe 2002). Obviously, the greater the time children allocated to work and economic activities, the increasingly difficult it becomes to attend school since one cannot eat his/her cake and still have it..
According to ILO 2006, report, 74.4 million children aged 5-14 year who skipped school and engage in employment were victims of physical and mental hazard, most common are road and industrial accidents, abduction and ritual murder etc. many of them have been hit by cars, tricycle (Kekeneppe), motor cycle (Okada), bicycle etc leading to deaths, disabilities and various magnitude of injuries. The National Modular Child Labour Survey (NMCLS 2001) confirmed that “across zones, South East recorded the highest percentage – 16.4 percent-of children who suffered injury often, followed by children in the North-West who recorded 7.8 percent. Whilst South-South, South-West and North-central recorded 2.8 percent, 2.9 percent and 1.1 percent respectively, North-East had the least percentage of 0.9 percent of children who suffered injury often (NMCLS, 2001 P.97). There is also a psychological dimension to the health related issues of child labour. These include; low self-esteem, stigmatization, personality crises since they often see and hear things beyond their maturity. Thus posit a huge challenge that negatively affect their cognition and retention abilities. Generally, working children are known perceived themselves as less privilege and less fortunate than their non-working counterparts. An ILO survey across 26 countries found that at least one in every four economically active children suffered sickness and injury as a result of their work, while about 2.7 million healthy year of life are lost due to child labour, each year with the highest rate in the sectors where children are employed, (ILO, 2006). Such hazardous incident could eventually jeopardizes the capability of being sound academically.

Despite the various views on the effect of child labour and the contradictory opinions by some authorities, in all, time spent in school is a poor measure of learning in school. Above, it was separately indicated that child labour and time in school may be inversely related, even if child labour does not harm learning. It is possible that child labour harms learning even if it does not alter time in school. For example, it is possible that child labour does not alter school enrolment, or even that it does not alter school attendance because child leisure is lowered to make time for child work. However, child labour could still adversely affect school outcome by limiting time spent on homework, or it could leave the child too tired to make efficient use of the time in school. Numerous studies of learning tell us that it is cognitive achievement or highest grade attained that matter for learning’s not time spent in school perse.

The purpose of this study was to investigate the relationship between child labour and academic performance among Junior Secondary School (JSS III) students in Ogoja education zone of Cross River State, Nigeria.

III. RESEARCH QUESTION

What is the relationship between child labour and academic performance among Junior Secondary School (JSS III) students in Ogoja education zone of Cross River State, Nigeria?

IV. STATEMENT OF HYPOTHESIS

HO: There is no significant relationship between child labour and academic performance among Junior Secondary School (JSS III) students in Ogoja education zone of Cross River State, Nigeria.

V. METHODOLOGY

Ex post-Facto research design was adopted. A 30-item questionnaire and a 40-item achievement test were the instruments used to gather data for the study. Simple sampling technique method was applied. Six hundred and ten (610) students were randomly selected from the 74 public secondary schools in the zone using two schools each from a Local Government Area in the zone for the study. Data gathered were subjected to Pearson Product Moment Correlation Coefficient. The result of the analysis revealed negative significant relationship between child labour, and academic performance of upper basic students in Ogoja education zone of Cross River State, Nigeria.

VI. PRESENTATION OF RESULTS

From table 1 below, it can be discerned that with 606 subject, the $\sum x$, $\sum y$ were 2349, 881 and $\sum x^2$, $\sum y^2$ of 4321 and 2119 respectively. The sum of product for $\sum xy$ is 5816 with a mean of 21.95 and 8.39. Their population standard deviation is 2.94 and 1.45. At 0.5 level of significance the calculated r-value was found to be -0.94 with 604 degrees of freedom, the r cri value was 0.195. Since the r cri value was less that than the r calculated value of -0.94 the null hypothesis that states “there is no significant relationship between child labour and students’ academic performance” is rejected. This implies that the more the child is labored, the lesser the academic performance. Aptly puts there is indeed a statistical negative relationship between child labour and students’ academic performance.

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Result of Pearson’s product moment correlation coefficient of child labour and students’ academic performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>N = 606</td>
<td>$\sum X$, $\sum Y$, $\sum X^2$, $\sum Y^2$</td>
</tr>
<tr>
<td>Child labour (x)</td>
<td>2349</td>
</tr>
<tr>
<td>Students academic performance (y)</td>
<td>881</td>
</tr>
</tbody>
</table>

* Significant @ .05 df 604 r-cri 0.195
VII. DISCUSSION OF FINDINGS

The correlational statistical analysis with child labour and students’ academic performance shows that there is indeed an inverse relationship between child labour and students’ academic performance. This implies that the nature of treatment that a child is subjected to is significantly related to the child performance in school. This finding is in consonance with the finding of convention on the right of the child (CRC 2007) who described child labour as paid and unpaid work that occurs in any sector including domestic and Agricultural sector that are harmful to children’s mental, physical, social or moral development of the child. The findings of this study is also in agreement to Robinson (2009) who observed that the phenomenon of child labour is arguably the tallest challenges that impacts directly on school enrolment, attendance, academic performance, completion rate as well as health rest, leisure and the general psychological disposition of children. Rosati and Rossi (2003) attending school and working are decision that are usually considered simultaneously as a family. Conversely, these authors also posit that the number of hours the child devotes to work is one of the fundamental variables for evaluating the child performance in school.

The above finding also corresponds to Moses (2005) who lamented that child labour still remain a serious problem in many parts of the world even when the United Nations conventions on the Right of the child (UNCRC) states clearly that “government should recognize the right of the child to be protected from economic exploitations and from performing any work that is likely to be hazardous or harmful to the child’s development or to interfere with the child’s education. Also, the ministry of social welfare in it 2014 reports after it advocacy visit to schools in Cross States gave child abuse as major bane to students academics.

However studies by Jenson and Nelen, (2007) contradict the present study as they found that among child labour in Nigeria, only 2 percent participants mentioned labour as the reason for abandoning studies. The authors look at other variables that could affect academic work and not just labour. e.g gender, income level of parent, subject etc.

The gap that previous studies have not been able to fill which the present study is concerned is that, while other studies considered primary pupils with fewer sample size. The present study is concerned with secondary school students with larger sample size.

VIII. CONCLUSION

The study established that child labour is very common and noticed among secondary school students in Ogoja education zone of Cross River State. It will not be an overstatement to say that child labour is one of the 21st century’s greatest challenges to socioeconomic development. As already noted, the phenomenon has traumatized many and is denying a vast number of children in the developing world access to schooling, thus making education for all (EFA) by the year 2015 more of a mirage than a reality. And for the children who manage to enrol in school find it very difficult to compete favourably with their counterpart who are not involved or exposed to child abuse. The result of this study specifically reveals that poor performance are unavoidable characteristic of child labour., as children who are victims have limited period of academic concentration.

IX. RECOMMENDATIONS

Based on the findings of this study and in order to promote students’ academic performances, child labour should be avoided and parents, community leaders, and young people should be sensitized on the dangers that child labour pose to an individual and the entire nation.

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Advancing Technology and Financial Performance of Commercial Banks in East African Community Partner States

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Abstract: The main purpose of this study was to assess the effect of advancing technology on financial performance of Commercial Banks in East African community partner States, specifically; The study was guided by the following specific objectives: the role of Mobile advancing; the importance of Internet advancing; the impact of Electronic Card advancing both on financial performance of Commercial Banks in East African community partner States. Different methods and methodologies were used during this study. The Stratum sample size strategy has been used to determine which number of banks per States member of East African Countries should be obtained. Data; with Stratum sample size mathematic formula, equally EAC States members provided their financial Institutions (Banks) accordingly such as 3 out of 12 Commercial Banks in Rwanda; 10 out of 48 Commercial Banks in Kenya; 8/35 Commercial Banks of Tanzania; 6 out of 25 Commercial Banks in Uganda; 5 out of 22 Commercial Banks in South Sudan and finally 2 out of 10 Commercial Banks in Burundi with the total Commercial Banks of 34 out of 152 were visited with an error of 15% and confidence coefficient of 85%.

In this Study, the researchers brought out different interrogations on the Public part that providing additional energy to upkeep environment understanding on the level contribute technology advancing on achieving the expected customers and Banks Profitability and satisfaction; growing of Capital adequacy; availability of the Asset quality; customer and Banks Liquidity services and Risk management control of Commercial Banks.

In the results found, 100% of the respondents confirmed that all the Commercial Banks in East African Community partner States are using mobile advancing system and more than majority 76% demonstrated that technology advancing system are contributing a lot on the Financial performance of Commercial Banks and a model on the best practices of using technology advancing in enhancing financial performance was determined by researchers that will continue being refer in East African community partner States.
Index terms: Mobile advancing; e-commerce advancing and banking Instruments advancing

1 Introduction

The 3rd revolution came out with new possibilities in terms of information system access and Availability simultaneously, introducing new challenges in protecting sensitive information from intruders while making it available to others. Commercial Banks is one of the segments that the technological development is supervised closely and used widespread develop new component of products and services for advancing market as it’s assuming to implement its activities in different financial markets.

Information communication Technology based on applications such as internet advancing, mobile advancing, telephone advancing, automated teller machine (ATM) and Point of Sale (POS) network brings significant advantages to the economic performance of the Commercial Banks in the quickly delivery of existing Sets products and service, (Ilyas A. et al. 2015).

Theoretical and historical perspective on the Commercial Banks took stages of instigating technology advancing facilities at mid-1990s, while consumers were under hesitant to conduct financial transactions over the web; it took widespread adoption of electronic commerce, based on trailblazing companies such as America Online, Amazon.com and eBay, to make the idea of paying for items online extensive, (Sameni, K. et al. 2008). By 2000, 80 percentage of United States, Europe and few countries of emerging economy Countries started to bid technology advancing facilities. During the said period at least 550 Commercial Banks of these continents became the first tiers to top more than 6 million online banking customers, more than 40 percent of its customer base. In comparison, larger national institutions, such as Citigroup claimed 4.2 million online relationships globally, while J.P. Morgan Chase estimated it had more than 750,000 online banking customers, (ibid. 2008).

As the evolution of online advancing continued, it slowly began to gain popularity in e-commerce. When big-name banks began to offer online products and services, internet advancing seemed to gain legitimacy for consumers and assisting the economic performance of their interim of providing the necessary. By 2000, online advancing had become mainstream in the large world business, (Sameni, K. et al. 2008).

According to Steven (2002), demonstrates that the advancing engineering in 21st century runs in a complex and competitive environment branded by the changing circumstances and very unpredictable economic climate in African, particularly the said Commercial Banks. Information and Communication Technology (ICT) is like as was the main tools at the Centre of this change curve of technology Advancing System in Africa today. As for Sarah S., et al. (2012), added that Advancing sector revolution introduced at the beginning of the last decade.
have contributed to a sharp acceleration in credit to the private sector across the East African Community State member in recent years supported with introduction of technology advancing as strategy that should continue backing the achievement of their both Financial Institutions and Consumers in terms of financial performance of their activities across the region and successfully implementation measures to liberalize state-controlled advancing (banking) systems, restructure loss-making institutions, write off nonperforming loans, and improve governance and financial sector supervision.

This scientific research study has been provided the Problem Intention which could be based on during the theories and model created on the best practices which should be referring on the success of those Commercial Banks intentsto their financial performance with precise impartial to undertake such as the role of Mobile advancing, the importance of Internet advancing and lastly the impact of Electronic Card advancing by positioning the operators of the said System. Of cause scholars curry out this study because there are serious critical snags on the Nations(population) on the regional such as Poor understanding (Academic level); Careless (Negligence) and Resistance on change which push majority of these population keeping their currency (money) home-based; knowledge and habitual capacity on using electronic material is critical, electronic Equipment insufficient, internet connection low (more time out of services) and Service delivery by the technology advancing internet also squat.

2. Literature reviews
Diverse theories and models related to this prose review were founded on to file the conceptual relationship that should be escalated between technology advancing and financial performance of Commercial Banks in East African community member States. This assessment has been assisted the researchers distinguish what were the results from others dons (scholars) vis a vis on the said area as theoretical review brought it out and their observation reviews were striking the researchers’ specific target.

2.1 Theoretical and empirical framework
In this Study, the researchers were based on theories from various scholars which backed them on determine the relationship that could exist between technology advancing and financial performance of the Financial institutions activities in east African community states member in particular, the world affairs in general. This study has been supported by the following theories and models on technology advancing amenities such as:

2.1.1 The revenue model for mobile advancing and payments by Ben S. et al. (2011)

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Different revenue models were created to advancing out the mobile advancing and payments as was illustrated by Ben S. et al. (2011). Those models as Revenue model are:

- **Versioning and packaging:** Their research suggests that 76% of the youth market should pay monthly fee of $5 to $8 for a functionally rich mobile advancing service. This service must include Informational, Transactional and Interactive services.

- **Transaction pricing:** Transactions relate to any number of specific events that customers initiate proactively. This may be payments (retail purchases, remittances, bill payments, etc.), share trading, Short Message alerts, ATM withdrawals, etc.

- **Mixed pricing:** As combination of both revenue models and is used extensively by mobile network operators. This revenue model relies on a lower package price for basic services and the opportunity for customers to purchase Bolton’s.

**Figure 2.1: The revenue model for mobile advancing and payments**

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As for Simpson (2002) confirmed that the Pay-by-Phone Systems should assist the customers on the collaboration with their Commercial Banks and backed by the instructions to pay certain bills or to transfer funds between accounts; Direct Deposit assist the customers make specific deposits, (like pay checks and Social Security check and other benefits) to his/her account on a regular basis, its assisting the customers to pre-authorize direct withdrawals that recurring bills (like insurance premiums, mortgages, utility bills, for Consumers) which are paid automatically. Being cautious before the customer pre-authorize direct recurring withdrawals to pay companies he/she isn’t familiar with; funds from your bank account could be withdrawn.
improperly. Also monitor his/her bank account to ensure that direct recurring payments from her/his account to others is for the correct amount, (Simpson, 2002).

For Brian, J. et al. (2009), approximately exposed that 10% of mobile phone users conduct some advancing transactions by phone. Chief among these users are the members of Generation Y, who were born between 1979 and 1994. Also known as “millennials,” these youngest adult consumers represent the fastest growing segment of today’s workforce and 25% of the global population:

- Early technology adopters: Generation Y consumers are digitally sophisticated and hyper connected to one another. Half send an average of 50 text messages per day, 97% are active on Facebook and other social networking sites and 80% are active online. Advancing users Smartphone users, including many Generation consumers, are three times more likely than consumers with traditional feature phones to use mobile banking and more importantly are significantly more active user’s behaviour that translates into greater loyalty, stickiness, and, eventually, stronger advancing relationships.

- Significant earnings capacity: While Generation Y consumers currently earn approximately $215 billion annually, their annual income is expected to reach $3.4 trillion by 2018 and eclipse baby boomers’ earnings additionally; millennials are expected to inherit more than $1 trillion over the next decade making them an attractive target market with an increased appetite for advancing services.

- High growth/high potential market: In the United States, approximately 20 to 25 million Generation Y consumers will potentially become new advancing customers over the next five years

Figure 2.2: Relative transaction cost per channel usage
As conclusion we could say that based on the graphic bellow, the cost of processing a transaction via mobile phone can be as much as 10 times lower than via an ATM and as much as 50 times lower than via a branch that play a vigorous role on the financial performance of Commercial Banks in East African community member States.

2.1.2 Internet advancing acceptance model: Cross-market examination by Bander, A. et al. (2010)

The importance of loyal customers to business survival representsa well-known truism. The Internet has expanded horizons for businesses worldwide, especially e-services. Because of the intangible, informative nature of banking, banks are efficient users of online technology. Banks strive to understand customers’ e-behaviours worldwide, though much research focuses on industrialized countries, such as the United Kingdom (UK) and United States. The behaviours of consumers in many other countries, even those with massive economies, such as Saudi Arabia, the world’s top oil exporter with the 25th Ranking in terms of gross domestic product, remain uncertain, especially online.

2.1.2.1 Technology Acceptance Model

User acceptance remains a barrier to the success of new information technologies (IT). In an attempt explain this; Davis (1989) introduced TAM as an extension of TRA (Fishbein And Ajzen, 1975), based on the attitude-behaviour paradigm from cognitive psychology. Davis (1989) argues that people adopt an application primarily because of the functions it performs and secondarily because of the ease or difficulty associated with making
the system perform these functions. The model provides a basis for tracking the impact of external factors on internal beliefs, attitude, and behaviour (Davis et al., 1989).

2.1.2.2 Theory of Planned Behaviour

Theory of reasoned actions is ill-equipped to predict situations where people possess low volitional control. In the TPB, Ajzen (1991) incorporates perceived behavioural control (PBC) as an antecedent of behavioural intentions to overcome this limitation. Therefore, in the TPB, a person’s performance of certain behaviour depends on his or her intention toward that behaviour; intention in turn relies on attitudes, subjective norms (SN), and PBC.

2.1.2.3 Trust component on Commercial Banks

Trust is at the heart of all kinds of relationships (Morgan and Hunt, 1994). Definitions and conceptualization vary with disciplines, such that psychologists view trust as a personal trait, sociologists consider it a social construct, and economists see it as an economic choice mechanism (McKnight and Chervany, 2002). In the social psychology realm, Rousseau et al. (1998, p. 394) define trust as “perceptions about others’ attributes and a related willingness to become vulnerable to others.” In this sense, consumers might not use e-commerce because they lack trust in Internet businesses (Grewal et al., 2004).

Figure 2.3: Internet advancing acceptance model
As for Simpson (2002) demonstrated the performance of internet advancing for these services to take place, customer must have an agreement with his/her Bank that should assist him/her to make the said transfers; Personal Computer advancing gives the customer handle many advancing transactions via his/her personal computer. For instance, customer may use his/her computer to view his/her account balance, request transfers between accounts, and pay bills electronically.

2.1.3 Cash, Check or Bank Card? The effects of transaction characteristics on the use of payment instruments by David, B. et al. (2006)

Recent empirical investigations support the view that the substitution of electronic for advancing based on the systems can reduce the social cost of a financial institutions’ payment system. Humphrey et al., (2003), for instance, note that “if a country moves from a wholly paper-based payment system to close to an all-electronic system, it may save 1% or more of its GDP annually once the transaction costs are absorbed”. However, people are not necessarily prepared to adopt and use electronic payment systems. The failures of several electronic purses in Europe, for instance, are well documented (Hove, 2004) even if these payment instruments can be theoretically less costly (Shy and al. 2002). Understanding the reasons why people adopt and use electronic payment instruments can thus become a primary concern for advancing and monetary authorities. Why do people still prefer to use cash? Why are checks sometimes preferred to bank cards to settle transactions? What are the factors that influence the use of a payment instrument?

Empirical investigations on the choice of payment instruments are relatively recent. Two main groups of empirical studies may be commented on. A first group of contributions attempts to analyze the influence of particular effects on the use of payment instruments or the specific use of payment instruments such as electronic payment systems. For example, the works of Mantel (2000), Stavins (2001) and Hayashi and Klee (2003) highlight the role of socio-demographic and technological factors on the propensity to use electronic payment systems or the probability of them being used. Mantel (2000) proposes a framework to describe why consumers pay bills electronically. Using US national survey data, the author shows that wealth, personal preferences and certain demographic factors are significant to explain the use of electronic bill payments.

Figure 2.4: Cash, Check or Bank Card model
Source: Cash, Check or Bank Card model by David, B. et al. 2006

2.1.4.4 The current situation of the real e-advancing on financial performance of Commercial Banks

First of all, the bank must fully understand and appreciate the fact that the advancing industry now exist, in a global village; must therefore strive to provide local and global advancing services using the infrastructure of the global village and Most Current E-advancing applications should use the internet. According to Any awaokoro, (1999), The advantages of on line advancing are in providing convenience and flexibility for customers, Some online advancing allows customers to get current account balances at any time; Customers do not need to wonder whether a check of has cleared or a deposit has been posted. At the click of a button, customers can easily check the status of their current savings and money-market accounts through online advancing; Banks can provide immediate account enquires or statements online for customers (Casalo et al, 2007).

2.1.4 Empirical framework
2.1.4.1 The role of Mobile Advancing on financial performance of Commercial Banks

According to Hamid R. D. (2012), illustrates that mobile advancing is growing at a remarkable speed and it is bound to further grow in a significant way in the near future; The field of mobile payments and mobile advancing is not only new and fast evolving in East African community member States, but also sits at the overlap of several regulatory and legislative domains those of advancing and telecommunication which substantially raises the risk of coordination failure, where legislation or regulatory approaches are inconsistent or contradictory. This is creating considerable uncertainty about the appropriate regulatory response that must be established and also what supervisory regime applies to the various activities involving banks and non-banks. As for Barnabas A. (2014) added that Mobile money transactions have presented regulatory challenges that could potentially hinder maximum development benefits. This is because firstly, mobile money blurs the traditionally distinct and independent sectors of regulation (most notably, the telecommunications and financial banking sectors); It often involves an overlap between multiple ministries and Government agencies, thus adding to the complexity of oversight needed.

Within their study done by Donner et al. (2008) found out that mobile banking and economic development in East African Community member states where they sought to link adoption can be impacted and used; the study established that through offering a way to lower the costs of moving money from place to place and offering a way to bring more users into contact with formal financial systems, m-banking/m-payments systems could prove to be an important innovation for the developing world. However, the true measure of that importance required multiple studies using multiple methodologies and multiple theoretical perspectives before answering the questions about adoption and impact.

Tiwari, et al. (2006) added that since mobile banking started to be considering as a business strategy in East African community’s member states; these were impacted the technologies advancing with the customer behaviour and its implications role on these Financial Institutions (Banks). The scholars sought to examine these opportunities on these Financial Institutions (banks) to generate revenues by offering value added; innovative mobile financial services while retaining and even extending their base of technology-savvy customers.

2.1.4.2 The contribution of Internet advancing on financial performance of Commercial Banks
According to Stephanie, K. et al. (2015) revealed that the Internet advancing (e-advancing) is the use of internet and telecommunication networks to deliver a wide range of value added products and services to bank customers; Internet advancing includes importing data into personal accounting software. Some online banking platforms support account aggregation to allow the customers to monitor all of their accounts in one place whether they are with their main bank or with other institutions. Internet banking is called transactional online advancing, because it involves provision of facilities such as accessing accounts, funds transfer and buying financial products or services online. The Internet also helps banks penetrate other financial markets without requiring their physical presence in those markets. The widespread availability of Internet advancing is expected to affect the mixture of financial services produced by banks, the manner in which banks produce these services and the resulting financial performances of these banks, (ibid 2015).

With the emerging wave of information driven economy, the Financial Institution (banks) industry in Kenya, Uganda, Tanzania and Rwanda ones of the East African community member States have inevitably found themselves unable to resist technological indulgence. This has led to a boom in development of mobile advancing laying down a strong base for low cost advancing and growth of mobile phone use in rural areas of those Countries member states of EAC. Standard Chartered in 2009 launched its mobile banking in seven markets in Africa; In the Kenyan market it offers a number of services on a unique, user-friendly platform called Unstructured Supplementary Services Data (USSD) and is only available on GSM carrier networks which enable customers to access banking in real time, anywhere in the world, through their mobile phones.

2.1.4.3 The impact of Electronic Card advancing on financial performance of Financial Institutions (Banks)

Fox and Beier, (2006) shows the impact of Electronic Card for Fox and Beier, (2006) illustrated the impact of Debit Card on Purchase or Payment Transaction let you make purchases or payments with a debit card, which also may be your ATM card. This could occur at a store or business, online or by phone. The process is similar to using a credit card, with some important exceptions (While the process is fast and easy, a debit card purchase or payment transfer’s money; fairly quickly; from your bank account to the company’s account. So it’s important that you have funds in your account to cover your purchase. This means you need to keep accurate records of the dates and amounts of your debit card purchases, payments, and ATM withdrawals. Also be sure you know the store or business before you provide your debit card information to avoid the possible loss of

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funds through fraud. Your liability for unauthorized use, and your rights for error resolution, may be different for a debit card than a credit card (Simpson 2002).

Agboola (2001) concludes that electronic banking has tremendously improved the services of the financial institution (banks) of the East African community member States on their financial performance on their customers in region and out of the region. Siam (2006) examined the effect of electronic banking on bank’s profitability in Jordan. The population of the study included all working banks in Jordan which have sites on the internet for the periods of 1999-2004. The result from the data analysis that was gathered from the study instrument (questionnaire) showed that there is a correlation with statistical significance between electronic banking and banks profitability. Showing a negative effect in profitability in the short run and a positive effect in profitability in the long run. Thus, managers and banks employees in the area prefer their banks to expand their electronic operation in servicing customer but not converting all banks to total electronic banks.

2.1.4.4.1 Internet component on Commercial Banks

Fox and Beier, (2006) Most of the applications mentioned involved the use of internet, E-advancing is more than just Internet advancing in the still evolving e-climate in the economy; it involves using the net to Exploit new opportunities by transforming products and markets and business processes (E-advancing also means developing new relationship with customers, regulatory authorities’, suppliers and advancing partners with digital age tools, for example, it requires all understanding. Customer/bank relationships will be more personalized resulting in novel modes of transaction processing and services delivery. E-Advancing is essentially about banks using new age methods and tools to expand into new advancing markets and grows. Creating a corporate online presence for your bank should be more than just buildings a website. It should be about building a web business for your bank, to do this effectively the people in charge, i.e. the CEOs not just IT directors and managers must have a deep knowledge of what E-advancing culture demands (Clive, 2007).

2.1.4.4.2 E-business component on Commercial Banks

According to Hampton-Sosa et al. (2005), the Information Technology backed by E-business or E-commerce is not about routine information management or automation, it is about using these unique tools to create opportunities, create new markets, new processes and growth or increase the creation of e-wealth (E-advancing monitors the environment local and global with the aim of understanding and mastering its environment. E-Advancing thus involves collaboration (local and international) on payments systems, cashless transactions, digital cash and other electronic based projects.
As for Usman (1998), added that Information Technology can be seen as other immense potentials than can be realized if bank management and staff, not just the systems staffs are sufficiently literate and aware, and presently the banking industry still has a lot to do in terms of training staff; The speed of change together with the need for proper orientation for the e-world makes training even more of a necessity. For E- advancing to be effective, an area that must be addressed is security, for any Information System based service associated with e- advancing increases the need for security, in e- advancing the core security areas should be addressed. A key concern is that of privacy. Business on the net cannot be undertaken without addressing the privacy concerns of people you do business with. It requires the existence of a privacy policy. No customer wants to click away to a negative balance. Security in online banking is typically provided through the use of an electronic Identity (EID) and password.

For Hampton Sosa, et al. (2005), these and other security measures must be effective to prevent not only the breach of privacy, but other security concerns like the alteration of data. In conclusion to be a true E- advance each bank must identify its own unique targets, focus and style. Banks needs to realize that E- advancing is more than simply banking on the internet; E- advancing is more than having a website, E- advancing is about building a web business for your banks.

2.1.5 Financial Performance of Commercial Banks

The Financial institutions should organize its activities success in areas related to its resources, obligations and overall market strength. Many corporate operators, Commercial Banks included take regular stock on either a formal or less formal basis of general profitable presentation of their corporation to make sure that it remains on the right track economically

Several studies (Elyor (2009), Uzhegova (2010)) have used CAMEL to examine factors affecting bank profitability with success. CAMEL stands for Capital adequacy, Asset quality, Management efficiency, Earnings performance and Liquidity. The system was developed by the US Federal Deposit Insurance Corporation (FDIC) for “early identification of problems in banks” operations” (Uzhegova, 2010). Though some alternative bank performance evaluation models have been proposed, the CAMEL framework is the most widely used model and it is recommended by Basel Committee on Bank Supervision and IMF (Baral, 2005).

Capital adequacy refers to the sufficiency of the amount of equity to absorb any shocks that the bank may experience. The capital structure of banks is highly regulated. This is because capital plays a crucial role in
reducing the number of bank failures and losses to depositors when a bank fails as highly leveraged firms are likely to take excessive risk in order to maximize shareholder value at the expense of finance providers.

**Figure 2.5: Intermediate and Long Term Investing employing Technical and Fundamental Analysis to maximize performance**

![Graph showing financial performance](resource: financial performance graphic by Technical Investor, 2011)

The sector of financial performance demonstrates its importance on the life cycle of the human being in these days where everyone can touch or affect by an indicator come from the financial aspect more than other component. The researchers remain rather unenthusiastic about the risk to reward at current stock market prices, as how much higher can them go without a meaningful correction. However the researchers advocate a balanced approach for investors where one doesn’t need to sit in cash and listen to the doom and gloom, but also doesn’t go all in with all the leverage and beta one can find, either.
According to world trade public Organization forum (2009) and Orio G. et al. (2010) demonstrates how the performance of a finance component is usually measured in terms of the achievement of profitable goals or objectives; These objectives can be long term, such as sustainable growth and development, or short term, such as the stabilization of the economy in response to sudden and unpredictable events, called economic shocks. The economic indicators measure on macro-economic variables that directly or indirectly enable economists to judge whether economic performance has improved or deteriorated; Tracking these indicators is especially appreciated to policy makers, both in terms of assessing whether to intervene and whether if the intervention has worked or not.

Those useful indicators are the levels of real national income, spending, and output. National income, output, and spending are three key variables that indicate whether an economy is growing, or in recession. Like many other indicators, income, output, and spending can also be measured in per capita (per head) terms; Growth in real national income; the Investment levels and the relationship between capital investment and national output; the levels of savings and savings ratios; Price levels and inflation; the Competitiveness of exports; the Levels and types of unemployment; the Employment levels and patterns of employment; The productivity of labour, which influences other economic variables, including an economy's competitiveness in international markets; Trade deficits and surpluses with specific countries or the rest of the world; the Debt levels with other countries; the proportion of debt to national income; The terms of trade of a country; the purchasing power of a country's currency; Wider measures of human development, including literacy rates and health care provision. Such measures are included in the Human Development Index (HDI) and lastly the Measures of human poverty, including the Human Poverty Index (HPI), (ibid 2010).

2.1.6 Models on the best practices

2.1.6.1 Conceptual framework

The main variable of interest is the study of dependent variable growth of corporate entrepreneurs which is measured by amount of credits from microfinance, good working environment, to meet customer satisfaction, to follow government policy, to establish strategic business plan, monitor and evaluation of business performance. Apart from this, organization, operating in secured environment, access to trainings and then forming joint ventures have seen as important to promote growth. The relationship between dependent and independent variable is shown as follow
In this Scientific research, different variables such as the independent variables also called manipulation were used to back up the theories and practices that should relate to the pillars like Electronic advancing; Mobile advancing; Internet advancing and E- Card advancing instruments that will positively impacting the financial performance of commercial banks with indicators like Profitability, Adequacy of capital, Asset Quality, Liquidity and Risk Management. The survey allowed the identification of these variables interacts with each other and showed how they will contribute to the economic performance of commercial banks.

Figure 2.7: Main reasons for using e-commerce
After deep analysis on the said study, a practical model that should assist the role electronic banking on finance and economic performance of commercial banks in East African community partner States was created to be applied by different actors from the commercial banks such as managers, direct implementers and customers in terms of financial transaction and economic management. The adoption from D&M is success model has exceeded all estimation. According to a citation search in the summer of 2002, more than 280 refereed papers in journals and proceedings that have referenced the D&M model during the period 1993 to middle of 2002 (Delone& McLean, 2003). This number shows that the model is successful and can be adopted for other researches.

**Source: Sensis e-business report in Australia**

### 2.1.5.2 Scientific Models

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Due to Government e-commerce initiatives</td>
<td>13%</td>
</tr>
<tr>
<td>Due to Government e-commerce initiatives</td>
<td>30%</td>
</tr>
<tr>
<td>To give/maintain competitive advantage</td>
<td>42%</td>
</tr>
<tr>
<td>Because our competitors introduced it</td>
<td>44%</td>
</tr>
<tr>
<td>To improve our cash flow</td>
<td>44%</td>
</tr>
<tr>
<td>To enable us to deliver a 24/7 service</td>
<td>44%</td>
</tr>
<tr>
<td>Because of requests from our suppliers</td>
<td>44%</td>
</tr>
<tr>
<td>In order to increase our market share</td>
<td>47%</td>
</tr>
<tr>
<td>To promote the company more effectively</td>
<td>49%</td>
</tr>
<tr>
<td>To help us improve our delivery of goods or services</td>
<td>50%</td>
</tr>
<tr>
<td>Because our customers requested it</td>
<td>55%</td>
</tr>
<tr>
<td>To reduce our advertising costs</td>
<td>57%</td>
</tr>
<tr>
<td>To make our business transactions cheaper</td>
<td>56%</td>
</tr>
<tr>
<td>To provide better service to our customers</td>
<td>75%</td>
</tr>
</tbody>
</table>

Follow the D&M IS Success Model (1992), we develop the framework as following
Figure 2.8: Research model for the factors affecting the performance of internet advancing at commercial banks

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Mediating Variable</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of network</td>
<td></td>
<td></td>
</tr>
<tr>
<td>System</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Easy to use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Convenience of customers</td>
<td></td>
<td>Economic Performance</td>
</tr>
<tr>
<td>Fast</td>
<td>Service satisfaction</td>
<td>Benefit for customers</td>
</tr>
<tr>
<td>Clear</td>
<td>of customers</td>
<td>Benefit for banking</td>
</tr>
<tr>
<td>Security</td>
<td>Willing to use</td>
<td></td>
</tr>
<tr>
<td>Personal data</td>
<td>Useable Satisfaction</td>
<td></td>
</tr>
<tr>
<td>Exchange data</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Materials and Methods

The ethnicity variable in this study was based on the sample of the population working in Commercial Banks implementing daily activities in East African community member States. The study also had a sample of Single Banks. The participation in the study was voluntary and anonymous; The research designs of this study was applied Qualitative research paradigm as a systematic subject approach used to describe the Profitability, Capital adequacy, Asset quality, Liquidity and Risk management through specific approach which was a Case study that described in-depth the experience of one or more than one Commercial Banks in East African community member States with the method of direct observation and interaction on the subject. In the findings it was established that Mobile banking system, Internet Banking and Electronic Card advancing can have a significant impact on finance and financial performance of Commercial Banks in East African community member States. Different Data have been obtained from officials of the Commercial Banks on 12 Banks of...
Rwanda; 25 Banks of Uganda, 42 Banks of Kenya, 35 Banks of Tanzania, 10 Banks of Burundi and 22 banks of South Sudan. In practice different tools have been used to support gears component with the following activities such as Selection of sample techniques, Develop research instruments questionnaires, Collection of data (the research has been used both primary and secondary data), data was Processed (using SPSS software which assisted on process) and analysis, interpretation and recommendations have been determined by the researcher.

3.1 Research approach

3.1.1 Qualitative versus quantitative research approach

Qualitative and quantitative methods are two broad approaches to research, and are two research approaches often used in research studies. While quantitative research involves numerical representation and manipulation observation for the purpose of describing and explaining the phenomena that those observations reflect, qualitative research on the other hand involves non-numerical examination and interpretation of observation for the purpose of discovering the underlying meaning and pattern of relationship. Qualitative research emphasis the process and meaning that are not rigorously examined or measured, in term of quantity, amount of intensity or frequency. In contrast, quantitative study emphasis measurement and analysis of causal relationship between variables, not processes (Casebeer et al. 2000). In quantitative research, variables and relationship are the central idea. Quantitative research is useful in providing detailed planning prior data collection and analysis, because it provided tools for measuring concepts, planning design stages and for dealing with population and sampling issues. In addition, a quantitative research approach utilizes a deductive model in testing the relationship between variables and to provide evidence for or against pre-specific hypothesis. Afterwards, our research has used both qualitative and quantitative research approaches. The study has been conducted in East African community member States with the Population study of Commercial Banks accredited with residence in East African community member States.

The Population, Sample size and Sampling technique study were focused on the officials of the financial Institutions (Banks) of different Member states of east African community such as Officials of the 3 commercial Banks out of 12 Banks of Rwanda; Officials of 6 commercial Banks out of 25 Banks of Uganda, Officials of 10 commercial Banks out of 42 Banks of Kenya, Officials of the 8 commercial Banks out of 35 Banks of Tanzania, Officials of the 2 commercial Banks out of 10 Banks of Burundi and finally the Officials of 5 commercial Banks out of 22 banks of South Sudan.

On Targeting population and sampling frame; the logic of qualitative research is concerned with in-depth understanding, usually working with small samples. Qualitative researchers are often interested in selecting a purposive or judgment sample. The type of purposive sampling is based on a particular research question as
well as consideration of the resources available to the researcher. A purposive sampling technique has been used to ensure that the practitioners in technology Banks and financial Performance of financial institutions are selected from the targeted populations to authoritatively present. The selection of experts has been based on two main criteria included: The responders’ adequate knowledge in the area of technology advancing as well as financial Performance. The researcher will select people purposively from the targeted institutions to provide information about the study variables as illustrated in table 3.1 below. In research, there happens to be very difficult to study exhaustively the whole population because; it is costly and sometime impossible. In conducting this research, a sample has been drawn depending on whole population under study and scientific requirements. Then, stratified random sampling has been used in selecting sample. By using formula of Yamane (1967) with an error of 15% and with a confidence coefficient of 85%, thus, the sample size was obtained as follow:

$$n = \frac{N}{1+N(e)^2}$$

Where,  

- $n$ = the sample size
- $N$ = the size of population (total financial institutions (banks) in East African Community member states)
- $e$ = desired level of precision (15%)

Thus, $n = \frac{146}{1+146(0.15)^2} = 34$

### 3.3.3.1 Proportional stratified sample size:

The proportional stratified sample size means that, the number of sampling units drawn from each stratum is in the proportion to the relative population size of that stratum.

Proportional stratified sample size is determined by the following formula:

$$n_h = \frac{N_h \times n}{N}$$

### Table 3.1: Stratum sample size

Stratified random sampling is a method of sampling that involves the division of a population into smaller groups known as strata. In stratified random sampling, the strata are formed based on members' shared attributes or characteristics. A random sample from each stratum is taken in a number proportional to the stratum's size when compared to the population. These subsets of the strata are then pooled to form a random sample.
### Stratum composition

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Population size $N_h$</th>
<th>Sample size of the stratum $n_h$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Rwanda</td>
<td>12</td>
<td>$n_{h1} = \frac{12+34}{152} = 2.68 \approx 3$</td>
</tr>
<tr>
<td>2 Uganda</td>
<td>25</td>
<td>$n_{h2} = \frac{25+34}{152} = 5.59 \approx 6$</td>
</tr>
<tr>
<td>3 Kenya</td>
<td>48</td>
<td>$n_{h3} = \frac{48+34}{152} = 10.43 \approx 10$</td>
</tr>
<tr>
<td>4 Tanzania</td>
<td>35</td>
<td>$n_{h4} = \frac{35+34}{152} = 7.80 \approx 8$</td>
</tr>
<tr>
<td>5 Burundi</td>
<td>10</td>
<td>$n_{h5} = \frac{10+34}{152} = 2.23 \approx 2$</td>
</tr>
<tr>
<td>6 South-Sudan</td>
<td>22</td>
<td>$n_{h6} = \frac{22+34}{152} = 4.92 \approx 5$</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>152</td>
<td>34</td>
</tr>
</tbody>
</table>

*Source: Primary data, 2017*

### 3.4 Data collection

The data of this study were collected by using questionnaire which had been carefully structured to cover all information’s needed which were able to answer the research question. The respondents to the questionnaires were the managers or people with authority within the bank.

### 3.5 Data analysis

Data analysis was carried out using quantitative methods through descriptive statistics and qualitative methods. Quantitative analysis involved numerical calculations on the observed data so as decipher what phenomena or relationship the observed values were indicating, while qualitative was based on reasoning with no numerical calculation and the ultimate objective was to get insight into the underlying reasons of an issue. The data obtained from the field was coded and entered into the computer and subsequently subjected to statistical analysis using the Statistical Package for Social Sciences (SPSS).

### 4. Results, Argument, Conclusion and Recommendations

The Facts and critical analysis done after collection of data by scholar on cases well identified with the purpose of provide the clarification on the objectives determined either by the scholars or any one from the private or public and come up with findings to be based on any measurement resolution.
4.1 Results, Argument

Table 4.1: Distribution of banks by country

<table>
<thead>
<tr>
<th>Country</th>
<th>Number of Banks</th>
<th>%</th>
<th>Name of bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rwanda</td>
<td>3</td>
<td>8.8%</td>
<td>Ecobank</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BPR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>EQUITY RWANDA</td>
</tr>
<tr>
<td>Kenya</td>
<td>10</td>
<td>29.4%</td>
<td>ABC Bank(Kenya)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bank of India</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Citibank</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Commercial Bank Of Africa</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Credit Bank</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Habib bank</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Equity Bank Kenya</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Prime Bank Kenya</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Kenya Commercial Bank</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>United bank</td>
</tr>
<tr>
<td>Tanzania</td>
<td>8</td>
<td>23.5%</td>
<td>Acess Bank Tanzania</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Amana Bank</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>International Commercial Bank</td>
</tr>
<tr>
<td>Country</td>
<td>Number</td>
<td>Percentage</td>
<td>Banks</td>
</tr>
<tr>
<td>---------------</td>
<td>--------</td>
<td>------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>South Sudan</td>
<td>5</td>
<td>14.7%</td>
<td>United Bank of Africa, Bank of Africa Tanzania, Citibank, Ecobank, Equity Tanzania</td>
</tr>
<tr>
<td>Uganda</td>
<td>6</td>
<td>17.6%</td>
<td>ABC Bank, Bank of India, Cairi International Bank, Commercial Bank of Africa, Ecobank Uganda, Equity Bank Uganda</td>
</tr>
<tr>
<td>Burundi</td>
<td>2</td>
<td>5.9%</td>
<td>Fin Bank Burundi(Local and National), CRDB Bank Burundi(Local and National)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>34</strong></td>
<td><strong>100%</strong></td>
<td>-</td>
</tr>
</tbody>
</table>

*Source: Field data, 2016*
The findings from table 4.1 shows that at least 29.4% of the Financial Institutions (Banks) from Kenya; 23.5% from Tanzania; 17.6% from Uganda; 14.7% from South Soudan; 8.8% from Rwanda and 5.9% from Burundi were chosen to be part of the sample size. Recall that the sample size of each stratum which were proportionate to the population and can give a sigificant funds that each stratum has the same sampling fraction.

**Table 4.2: Does your bank use mobile advancing that affect her economic performance?**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Cases Included</th>
<th>Cases Excluded</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Percent</td>
<td>N</td>
</tr>
<tr>
<td>Yes</td>
<td>34</td>
<td>100%</td>
<td>0</td>
</tr>
</tbody>
</table>

*Source: Field data, 2017*

The results from table 4.2 show that all (100%) respondents confirmed that their Commercial Banks in East African community member States are using mobile advancing system. The main reason that mobile banking is spreading among East African Member States is that most of these financial Institutions (banks) are initiated in the big cities and customers want to be facilitated on their business operation process.

**Table 2.3: If yes, how is affecting its financial performance?**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Cases Included</th>
<th>Cases Excluded</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Percent</td>
<td>N</td>
</tr>
<tr>
<td>Quickly and easy service delivery</td>
<td>34</td>
<td>100.0%</td>
<td>0</td>
</tr>
<tr>
<td>Increasing the institution’s capital</td>
<td>23</td>
<td>67.6%</td>
<td>11</td>
</tr>
<tr>
<td>Decreasing of the cost and other changes</td>
<td>25</td>
<td>73.5%</td>
<td>9</td>
</tr>
<tr>
<td>Easy transfers on both banks and customers</td>
<td>26</td>
<td>76.5%</td>
<td>8</td>
</tr>
<tr>
<td>Motivating bank’s financial activities</td>
<td>20</td>
<td>58.8%</td>
<td>14</td>
</tr>
<tr>
<td>By increasing deposit</td>
<td>21</td>
<td>61.8%</td>
<td>13</td>
</tr>
<tr>
<td>Motivating customers</td>
<td>22</td>
<td>64.7%</td>
<td>12</td>
</tr>
</tbody>
</table>

*Source: Field data, 2016*
The results from table 4.3 prove that all (100%) respondents confirmed that mobile money assist in quickly and easy service delivery, followed by 26 respondents represented by 76.5% in helpful in making easy transfers on both banks and customers, 25 respondents represented by 73.5% who confirmed that mobile money help in decreasing the cost and other changes, 23 respondents represented by 67.6% said that mobile money contribute in increasing the institution’s capital, 64.7% confirmed that mobile money motivate customers, 61.8% confirmed that it assist in increasing deposit, while 58.8% assumed that mobile money motivate bank’s financial activities. Mobile banking provides the customers to anytime and anywhere banking with the help of mobile telecommunication services, this facility is very easy accessible by each mobile internet users. It also saves a lot of time. The internet of mobile banking is very fast compared to other mode of banking.

Figure 4.1: At which Level of economic performance your Commercial Banks implement her economic performance?

Source: Field data, 2016

The results from figure 7 indicate that, the level of implementing electronic advancing system In East African Community Member States is 100 % at local perspective level and national perspective level respectively, 88.2% at regional perspective level, 26.5 at continent perspective level and 0% at World-wide perspective level.

Table 4.4: Justification for the answers

<table>
<thead>
<tr>
<th>Reason</th>
<th>Cases Included</th>
<th>Cases Excluded</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide International service to customers</td>
<td>30 88.2%</td>
<td>4 11.8%</td>
<td>34 100%</td>
</tr>
<tr>
<td>Service</td>
<td>Frequency</td>
<td>Percent</td>
<td>Valid Percent</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------</td>
<td>---------</td>
<td>---------------</td>
</tr>
<tr>
<td>Correspondence and collaboration banks</td>
<td>21</td>
<td>61.8%</td>
<td>13</td>
</tr>
<tr>
<td>Western union and other agencies services</td>
<td>17</td>
<td>50.0%</td>
<td>17</td>
</tr>
<tr>
<td>Mobile money services</td>
<td>8</td>
<td>23.5%</td>
<td>26</td>
</tr>
<tr>
<td>Pull and push services</td>
<td>8</td>
<td>23.5%</td>
<td>26</td>
</tr>
<tr>
<td>Easy cash services</td>
<td>8</td>
<td>23.5%</td>
<td>26</td>
</tr>
<tr>
<td>Payment and transaction</td>
<td>8</td>
<td>23.5%</td>
<td>26</td>
</tr>
</tbody>
</table>

Source: Field data, 2016

The outcome from table 4.4 explained the main reason of implementing electronic advancing system East African Community Member States; where 30 respondents corresponding to 88.2% declared that electronic banking system provide International service to customers, 21 respondents represented by 61.8% proved that it support in correspondence and collaboration banks.

Table 4.5: Do your customers use mobile advancing that facilitates bank's economic performance?

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>No</td>
<td>34</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Primary data, 2016

The results from table 5 show that all (100%) respondents confirmed that Commercial Banks in East African community member States’ customers are not connected on mobile advancing.

Figure 4.2: If no, why?
The results from figure 8 illustrate the main reasons of non-using mobile advancing by customers, where all (100%) respondents confirmed that the main reason is the poor understanding linked with law academic level and careless (negligence) respectively, while 20 respondents represented by 58.8% assumed that the reason of not using mobile advancing is related to resistance on change.

Table 4.6: What is your plan on motivate all of them using mobile advancing?

<table>
<thead>
<tr>
<th>Plan</th>
<th>Cases Included</th>
<th>Cases Excluded</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong Sensitization</td>
<td>34 100.0%</td>
<td>0 0.0%</td>
<td>34 100.0%</td>
</tr>
<tr>
<td>Resumption Advertisement</td>
<td>30 88.2%</td>
<td>4 11.8%</td>
<td>34 100.0%</td>
</tr>
<tr>
<td>Discouragement with High price on using paper sheet in different services</td>
<td>25 73.5%</td>
<td>9 26.5%</td>
<td>34 100.0%</td>
</tr>
<tr>
<td>Free charge on withdraw by using mobile banking</td>
<td>16 47.1%</td>
<td>18 52.9%</td>
<td>34 100.0%</td>
</tr>
<tr>
<td>Provide a physical motivation on the users</td>
<td>21 61.8%</td>
<td>13 38.2%</td>
<td>34 100.0%</td>
</tr>
</tbody>
</table>

Source: Field data, 2016

The results from table 4.6 show that 100% of respondents said that they have plan of organizing strong sensitization for their customers in using mobile money, 88.2% of respondents motivate their customers in...
using mobile advancing system through advertisement, 73.5% of respondents motivate their customers by increasing price on using paper sheet in different services offered by bank, 61.8% of respondents provide physical motivation the users such as (award, purse, grant, pouch, stipend), while 47.1% of respondents afford free charge on withdraw by using mobile advancing.

### Table 4.7: Does your Commercial Banks using internet advancing that affect her economic performance?

<table>
<thead>
<tr>
<th>Importance</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access on the account of customers</td>
<td>32</td>
<td>94.1%</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Facilitates Historical checking</td>
<td>30</td>
<td>88.2%</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Push and pull by both banks and customers</td>
<td>21</td>
<td>61.8%</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Easy Transfers on both bank and customers</td>
<td>25</td>
<td>73.5%</td>
<td>100.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Facilitate bank’s Payment and transaction</td>
<td>28</td>
<td>82.4%</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

**Source:** Field data, 2016

The results from table 8 demonstrate that all (100%) of respondents confirmed that Commercial Banks in East African community member States are using internet advancing.

### Table 4.8: If yes, how?

<table>
<thead>
<tr>
<th>Importance</th>
<th>Cases Included</th>
<th>Percent</th>
<th>Cases Excluded</th>
<th>Percent</th>
<th>Total</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access on the account of customers</td>
<td>32</td>
<td>94.1%</td>
<td>2</td>
<td>5.9%</td>
<td>34</td>
<td>100.0%</td>
</tr>
<tr>
<td>Facilitates Historical checking</td>
<td>30</td>
<td>88.2%</td>
<td>4</td>
<td>11.8%</td>
<td>34</td>
<td>100.0%</td>
</tr>
<tr>
<td>Push and pull by both banks and customers</td>
<td>21</td>
<td>61.8%</td>
<td>13</td>
<td>38.2%</td>
<td>34</td>
<td>100.0%</td>
</tr>
<tr>
<td>Easy Transfers on both bank and customers</td>
<td>25</td>
<td>73.5%</td>
<td>9</td>
<td>26.5%</td>
<td>34</td>
<td>100.0%</td>
</tr>
<tr>
<td>Facilitate bank’s Payment and transaction</td>
<td>28</td>
<td>82.4%</td>
<td>6</td>
<td>17.6%</td>
<td>34</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

**Source:** Field data, 2016

The findings from table 4.8 indicate how electronic advancing affect economic performance, where 94.1% proved that, it help to access on the account of customers, 88.2% of respondents confirmed that it facilitates historical checking, 82.4% of respondents said that it facilitate bank’s Payment and transaction, 73.5% of respondents said that it make easy transfers on both bank and customers, and 61.8% said that it help in push and pull service by both banks and customers. It is right that, by using internet banking, customer can check on his account and carry out transactions whenever it suit him, including evenings and weekends.
Table 4.9: What is the effect of using internet advancing by your bank on her economic performance?

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>Positive</td>
<td>12</td>
<td>35.3</td>
<td>35.3</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>4</td>
<td>11.8</td>
<td>47.1</td>
</tr>
<tr>
<td></td>
<td>Both</td>
<td>18</td>
<td>52.9</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>34</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Primary data, 2016

The results from table 4.9 indicates the sight of respondents in using internet advancing by their bank, 52.9% reported that the effect of using internet advancing is both positive and negative, 35.3% revealed that it has positive impact, and 11.8% revealed that, it has negative impact. Do Young et al.(2006) observed the financial performance of internet community bank in U.S. during 1999-2001. The results found that internet adoption improved community bank’s profitability, particularly through increased revenues from deposit service charges.

Table 4.10: Positive impact of using internet advancing

<table>
<thead>
<tr>
<th>Impact</th>
<th>Cases Included</th>
<th>Cases Excluded</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Percent</td>
<td>N</td>
</tr>
<tr>
<td>Service are easy and quickly</td>
<td>30</td>
<td>88.2%</td>
<td>4</td>
</tr>
<tr>
<td>Allurement(Solicitation) of the service</td>
<td>17</td>
<td>50.0%</td>
<td>17</td>
</tr>
<tr>
<td>Time management</td>
<td>25</td>
<td>73.5%</td>
<td>9</td>
</tr>
<tr>
<td>Preferable and appreciated by multination</td>
<td>21</td>
<td>61.8%</td>
<td>13</td>
</tr>
<tr>
<td>transactional corporate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Increasing bank revenue</td>
<td>24</td>
<td>70.5%</td>
<td>10</td>
</tr>
</tbody>
</table>

Source: Field data, 2016
The findings from table 4.10 were indicated by banks staff as positive impact of using internet advancing; 88.2% reported that internet advancing make service easy and quick, 73.5% said that it help in time management, 70.5% indicated that internet advancing contribute in increasing bank revenues, 61.8% indicated that internet advancing is preferable and appreciated by multination and transactional corporate, while 50.0% indicated that it facilitate allurement (Solicitation) of the service. The internet advancing has the advantage that customer avoid traveling to or from a bank branch. In this way, internet advancing save time and money, provides convenience and accessibility, and has a positive impact to customer satisfaction. Customers can manage their advancing affairs when their want and they can enjoy more privacy wile interacting with their bank. It had been claimed that internet advancing offers the customer more benefits at lower cost (Mold, 1998).

Table 4.11: Is your bank use electronic card advancing that affects her economic performance?

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>Yes</td>
<td>34</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Primary data, 2016

The results from table 4.11 show that all (100%) of respondents confirmed that financial institutions in East African Community Member States are using electronic card advancing that affects her economic performance.

Table 4.12: If yes, explain

<table>
<thead>
<tr>
<th>Cases Included</th>
<th>Cases Excluded</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Percent</td>
</tr>
<tr>
<td>Support on withdraw of money</td>
<td>29</td>
<td>85.3%</td>
</tr>
<tr>
<td>Help to pay different product at market</td>
<td>21</td>
<td>61.8%</td>
</tr>
<tr>
<td>Salaries and wages account situation</td>
<td>21</td>
<td>61.8%</td>
</tr>
<tr>
<td>Money stability(The transaction done by the two organs out of customers)</td>
<td>31</td>
<td>91.2%</td>
</tr>
</tbody>
</table>
As shown in table 4.12, 31 respondents represented by 91.2% mentioned that electronic card advancing guarantee money stability (the transaction done by the two organs out of customers), 85.3% of respondents reported that it support on withdraw of money, 61.8% reported that it help pay different product at market such as supermarket, 61.8% also motioned that it aid customers to check salaries and wages account situation, and 52.9% mentioned that it minimize national inflation (minimum physical money). Various studies have shown the benefit of electronic card advancing as maximum flexibility in payment transactions in small nominal amount. (Milner et al., 2002), noticed that, it help for example in transport, in cinemas, in clubs, in market and super market.

**Figure 4.3: If yes, explain**
4.2 Conclusion

The set Production on this Study curried out on Commercial Banks in East African community member States were demonstrated that the percentages of 4/5 of 160,057,000 population living in the region are not regularly using electronic advancing thro 48% are not even involve on the operators of technology advancing which bring out misplaced of financial performance and undesirable significances on the State’s monetary policy implementation. It should be renowned that technology advancing could play an excessive role on financial performance of financial institutions (banks) when countries brand energy on educating and encourage the system of socio-economic development of a particular State member of east African Community.

Technology advancing improves that financial performance of Commercial Banks in East African community member States, could not consider only as client’s facilitation of services and even the performances of the commercial banks but should considering its impact beyond business aspect up to the as one of strategic weapon for these countries member of east Africa community in particular, developing countries in general to improve its socio-economic development aspect. If specific States regulate its technique of encouraging and motivate the community to operate with these electronic advancing component, should eradicate the illness existing in the population of east African community state member such as poor understanding linked to academic level, careless (negligence) and resistance on change that still happening and sometime

Source: Field data, 2016
supported blindly by leadership system that cause the limitation of these Countries’ progress in terms of economic development.

Thus the objectives of this study which were based on the role of Mobile advancing; the contribution of Internet advancing; the impact of Electronic Card advancing and to develop a model on the best practices of electronic advancing strategy in enhancing financial performance of Commercial Banks in East African community member States, the findings revealed that 100% of respondents confirmed that financial institutions (Commercial banks) in East African Community states member are using electronic advancing that should continue support the achievement of their goals related with the growth of the said Commercial Banks. During this scientific Journey, the majority of 76.5% of defendants, illustrated that mobile advancing should playing a vibrant role on the Commercial Banks ‘economic performance such as quickly and easy service delivery; Increasing institution’s income; decreasing cost and other financial institutions changes; Easy transfers on both banks and customers and so on. The internet banking and electronic cards advancing well established should help in effective technology advancing system. Withdraw and transaction can be made anywhere at any time. In general, the technology advancing has made advancing transaction to be easier by bringing services closer to its customers hence improving performance of finance in East African community states member.

4.3 Recommendations
After long journey in this Study, the researchers provided and advised to consider strongly the recommendations bellow that should play if considered a vital role on the performance. Adoption of Technologies system by the leadership system in this member states, should influence the content and quality of banking operations doing by these Financial Institutions which could back and increase their performance. From all indications, Technology advancing presents great potential for financial performance and the business process reengineering of East African community member states’ Banks. Investment in Information technology should form an important component in the overall strategy of banking operators to ensure effective performance.

It is imperative for bank management to intensify investment in Information Technology and Information Communication Technology products to facilitate speed, convenience, and accurate services which will value their financial performance vis a vis to the customers, or otherwise lose out to their competitors. The banking industry in East African community member states presents Information Technology and Information Communication Technology providers with great opportunity to market their innovations which support them.
enough on their financial performance. Success in this area however depends on how they can customise their services to appeal to the ready minds of various stakeholders in the industry.

✓ The study recommends that the Commercial Banks in East African community member States should considered intensifying the mobile advancing as this will ensure service accessibility by customers and thus improving their financial performance.

✓ States member of East African community member States should focus on the third industrial revolution as the birthplace of informational technology system where business is facilitated with the support of using the software in terms of digital revolution. This age of the services supported by home computer, internet, cell phones, microwaves, automation and robots should be used to support the long projection of the nations with the sophistication considering as the rapid access of development that has given rise to the ever growing population world-wide.

✓ Government should brand correct Information Technology policy by certifying that Computer, Communication equipment and other Information Technology infrastructures, to a large extent, are manufactured in the countries so that Information Technology illiterates are considered, by making the equipment and infrastructures technological friendly. Also, government should contribute in ensuring focused telecommunication industry is visible to reduce or remove avoidable costs of implementing electronic advancing. To counter the threats and insecurity posed to net banking, like money laundering, fraud, among others, necessary legal codes backing the industry must be established and fully followed up as this will enhance the growth of the industry.

✓ Automated Teller Machine (ATM) should be put in different sites easily accessible by the operators, so that quick service and convenience is maintained hence improving bank processes. At the sometime constantly serviced should be ensured in order to provide reliability of the services.

✓ The Commercial Banks should subscribe to reliable internet providers for effective and efficient service delivery.

✓ The Commercial Banks should employ skilled personnel with more experience on network management in order to ensure the reliability of network.

✓ The Commercial Banks management should establish country wide supported by her Government training and seminars for clients on usage of various e business applications for efficient performance of the bank. For example, training on Automated Teller Machine (ATM) and VISA usage, internet advancing, and mobile advancing and soon.

✓ The bank should keep on upgrading their e advancing technology in order to have an up to date system for effective service delivery

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Abstract- The purpose of this study is to evaluate the effect of Audit Committee Qualities on Financial Reporting of listed companies in Nigeria. The study used structured questionnaires administered to a sample of 145 administrative staff of selected listed companies located in Rivers State, Nigeria to elicit the required data for hypothesis testing. The statistical technique employed in testing and analysing the hypothesis was the Ordinary Least Square regression analysis to accurately establish the effect of the dependent and independent variables with the aid of version 17.0 of the Statistical Package for Social Sciences (SPSS) computer software. Results of the analyses suggested that audit committee independence, audit committee members' qualification and audit committee monitoring function have a significant and positive effect on financial reporting of listed firms in Nigeria. The study provides evidence to shareholders that qualification of audit committee members should be considered seriously during their appointment to improving the quality of financial reporting and achieving audit committee members’ independence. Moreover, the result highlights the need for companies to organise training for audit committee members in the areas where in-depth knowledge is required especially on the application of new accounting standards which will aid financial reporting process of the company. The paper creates awareness on the need for identifying monitoring functions that are vulnerable to manipulation for critical analysis and intensive review in those areas.

Index Terms- Audit committee quality, financial reporting, Audit committee members Qualification, Audit committee monitoring, Audit independence

I. INTRODUCTION

Financial statements convey both qualitative and quantitative information to assist users in making an informed economic decision. Credible and high-quality financial statements that are free from any material misstatements or misrepresentation enhance users’ decision-making quality. An audit committee is required to improve the quality of financial statements required. An Audit Committee is an operating committee of the board of directors charged with the responsibility of overseeing the financial reporting disclosure of an entity and helping to set an ethical tone at the top level of an organisation (Bahreini, 2013). The Audit Committee ensures that the directors judiciously follow accounting regulations and laid down accounting principles and practices in preparing financial statements. Hence, section 359 (3 and 4) of the Companies and Allied Matters Act (CAMA), 2004 as amended, made it a requirement for every listed company on the Nigeria Stock Exchange (NSE) to establish an audit committee to improve their financial reporting (Enofe, Aroonwam&Abadua, 2013).

The United States (US) Congress passed the Sarbanes-Oxley Act (SOX) also known as the corporate oversight Bill in 2002 as a result of the publication of series of well-publicised accounting scandals around the world. That Bill is now widely accepted by most countries including Nigeria. The New York Stock Exchange (NYSE) and the National Association of Securities Dealers Automated Quotations (NASDAQ) also adopted the new corporate governance rules for listed companies. The Securities and Exchange Commission (SEC) approved them in 2003 (Madawaki & Amran, 2013). Both the new corporate governance rules of the NYSE and NASDAQ emphasised greater independence and effectiveness of the audit committees and board of directors (Person, 2005). The incidence that led to the collapse of Enron made the public call on members of the audit committee to improve the performance of their functions (Phuangthie&Phaprmke, 2010).

In Nigeria, there are also series of well-publicised cases of accounting improprieties. The state of financial reporting oversight provided by corporate audit committees was a source of concern to the Securities and Exchange Commission (SEC). The SEC, therefore, provided rules and standards that addressed the issue of the composition of audit committees and their activities. The SEC took this action with the hope that norms and standards provided would help to enhance the quality of financial reporting and discourage manipulation. SEC requirements complied with those of SAS 61 which requires a letter from the audit committee explaining the quality of the accounting principles applied and an assessment of their effect on the company's financial statements (Nashwa, 2003). Despite the responsibility given to audit committee and the inclusion of audit committee report in the annual report, companies still experience material accounting misstatement and misrepresentation which most at times eventually lead to corporate failure.

The most prominent in recent time in Nigeria is that of Oceanic Bank Plc. The bank overstated its gross earnings in the 2008 annual report. Instead of reporting a loss incurred it reported profit and equally understated its non-performing loans. This overstatement led to the restatement of 2008, 2009 and the first quarter of 2010 reports. The Central Bank of Nigeria (CBN) and the Nigerian Deposit Insurance Corporation (NDIC) conducted a special examination to assess the health of the Bank.
The action was taken to protect depositors' funds as part of its policy of safeguarding against the collapse of money (depletion of funds deposited) in Centre Banks. On August 14, 2009, the Central Bank selected a new management team which did not involve the Bank's executive management. The most pressing task for the new management was to address the reporting, governance and control deficiencies that endangered to submerge the Bank. They found out that there were internal control weaknesses, governance weakness and risk management lapses. According to Adewale (2010), the review of 2008 results was extensively, and that necessitated the restatement of the 2008 accounts. The restatement aimed at giving an accurate and fair view of the Bank's position as at 31st December 2008. The thoroughness of the reviews gives people the confidence that the audited restated accounts sufficiently addressed the misrepresentations report of 2008. The restatement revealed that after-tax profit previously reported as N 9.6bn resulted into a loss of N 234.6bn; Non Performing Loans previously reported as N54.5bn was reinstated as N 443.3bn (Adewale, 2010). This evidence shows that audit committee of the bank did not carry out its responsibilities.

Therefore, this paper examines the effect of audit committee qualities on financial reporting in Nigeria: employees' perception. The proxies for audit committee qualities are audit committee independence, audit committee members' qualification, and audit committee monitoring function.

Studies have been carried out by several authors on the audit committee. Most of these researchers based their study on the effect of audit committee report and audit committee size, composition, expertise and audit committee meeting on financial reporting quality (Okoye & Cletus, 2010; Owolabi & Ogbechikia, 2010, Madawaki & Amran, 2013). However, there is limited evidence on the effect of audit committee monitoring function on financial reporting via employees’ perception in Nigeria. This study is carried out to close the identified knowledge and make some contributions to knowledge.

II. LITERATURE REVIEW AND DEVELOPMENT OF HYPOTHESES

2.1. Literature Review

2.1.1. Audit Committee and Financial Reporting

According to the SOX Act 2002, an Audit Committee refers to:

“A committee (or equivalent body) established by and/or amongst the board of directors of an issuer for the purpose of overseeing the accounting and financial reporting processes of the issuer and audits of the financial statements of the issuer; and if no such committee exists with respect to an issuer, the entire board of directors of the issuer” (Sarbanes-Oxley Act of 2002).

The original concept of Audit Committees was as a means of ensuring the independence and effectiveness of the external auditor (Nnadi, 1999). As a result of corporate governance problems, their responsibilities have expanded to include working with the internal auditors and management to ensure proper conduct of corporate affairs, enhance corporate accountability and strengthen the financial reporting processes and practices of an entity (Ayinde, 2002). Hence the Audit Committee boosts an investor confidence in the operations of an entity with governance practice (PricewaterhouseCoopers, 1997). Audit Committee members are expected to have knowledge and experience of business risk, oversight performance, financial situations and accounting policies that will help in monitoring the activities of an entity (Enofe, Aronnwam & Abadua, 2013). Therefore, Audit Committees are valuable and rare resources of any entity and entities with higher resources and capabilities in the Audit Committee tend to gain reputation in the long run. Indeed, the existence of an Audit Committee in a body would provide a critical oversight of the entity's financial reporting and auditing processes (Walker, 2004).

Financial reporting is the provision of financial information about an entity to external users that is valuable to them in making economic decisions and for assessing the effectiveness of the entity’s management. Disclosure and transparency in the financial statements are vital factors of high-quality reporting (Enofe, Aronnwam & Abadua, 2013). Financial statements are the result of accounting transactions or economic dealings aimed at providing qualitative and quantitative financial information to appraise and forecast the performance of the entity to permit informed judgment and decision making (Ilaboya, 2005). The process of ensuring reliable financial reporting is one of the essential functions of the Audit Committee (Rezaee & Farmer, 1994). While the Audit Committee is not involved in the daily operations of an entity, there is pressure from the oversight position for the Audit Committee to get more involved in ensuring the integrity of the financial reporting process. Efficient Audit Committee processes for overseeing financial reporting are studied by Turley & Zaman (2007); Cohen, Krishnamoorthy & Wright (2007); Gendron, Bedard & Gosselin (2004); Smith (2003); Spira (2002). These studies, in general, have justified the expectation from the Audit Committees for review of all financial statements for approval by the Board of Directors before public circulation to ensure their objectiveness, accuracy, and timeliness. Other expectations include a consideration of all existing accounting policies, and their effect on the financial statements, any changes in accounting policies including the likely impact of any contemplated changes, appraisal of the major management estimates, and evaluate the adequacy of financial statement disclosures.

2.1.2. Audit Committee in the Nigerian Environment

In Nigerian, SEC, under the provisions of the Companies and Allied Matters Act (CAMA 2004: Section 359, subsection 3 and 4), requires all listed companies on the Nigerian Stock Exchange (NSE) to establish audit committees (Madawaki & Amran, 2013). The full acceptance of Audit Committees suggests their importance as part of entity accountability and transparency, where Audit Committees are expected to serve as the watchdog of stakeholders interest (Blue Ribbon Committee, 1999). The audit committee is made up of an equal number of directors and shareholders. This composition enhances its efficiency in checking the powers of the executive directors, with particular reference to the accounting and financial reporting functions (Enofe, Aronnwan and Abadua, 2013). It also enhances their reporting function and independence as it allows them to report to the executive Directors (Atu, Atu, Atu & Abusomwan, 2017).

2.1.3. Theoretical Framework
Audit Committee acts not only as a link between board and management but also to safeguard the interest of stakeholders. Some of the financial theories cover the concern for Audit Committee effectiveness in exercising these functions. The most directly related are these two popular theories, agency theory and stakeholders’ theory. Effective Audit Committees contribute more in these two theories, 2.1.3a. Agency Theory

Agency relationship emerged as a result of business expansion and complexities, and the separation of ownership and management. It is a contractual process whereby owners delegate some of their duties, responsibilities and authority to a team consisting of expert members(s) and expect them to display their expertise in the best interest of entity’s operational success and achievement of its objectives.

Hence, conflict of interests between owners and management emerges and grows. However, for accountability purpose, management decisions and actions need to be monitored. Close monitoring will be achievable when owners can actively partake in this control process. On the other hand, because of high-cost involvement and in some cases due to lack of expertise and knowledge, they cannot be actively involved in this process. Nevertheless, the board has to set monitoring apparatus because of their oversight responsibilities dedicated to shareholders (Johnson, Daily &Ellstrand, 1996). Dezoort, Hermanson, Archambeault & Reed (2002) posited that the board has to assume the oversight task of monitoring managers, approving entity’s strategies and evaluating control structure to deal with the problem emanating from agency relationship. The board usually hires experts and knowledgeable group of individuals to oversee management activities on its behalf. Audit Committee is such a subcommittee under corporate governance framework to which the board delegates some of its oversight functions and responsibilities. Chen, Duh & Shiue (2008) carried out a study on non-US companies trading shares in US market and argued that an effective Audit Committee can resolve or reduce agency problems of foreign entities no matter the complexity of the responsibilities the Audit Committee is charged with, it is evident that the members of the committee would have to possess the apt qualifications to be able to function effectively. A high level of financial literacy is essential for an Audit Committee to supervise a company's financial control and to report adequately. This service requires the Audit Committee to have accounting knowledge to be able to understand the financial report and ensure compliance with regulatory requirements. The need to comprehend, in general, the financial and non-financial contents of corporate reports is greater bearing in mind that listed companies are operating as conglomerates with some having complex group structures and consequently, presenting technically sophisticated financial reporting contents. Financial literacy abridged fraud in corporate financial reporting (Song &Windram, 2000). Kenneth (2012) was also of the same view with Song &Windramby arguing that for the proper discharge of responsibilities, all members of the committee should be financially knowledgeable and they should also have an understanding of the industry to which the company belongs. At least one member should have financial proficiency and professional qualification of the recognised professional accounting bodies. When the Audit Committee carries out their tasks correctly, the result is a credible financial statement which is the basis for good corporate governance and corporate failures will be avoided. The passing of the Sarbanes-Oxley Act (2002) in the US which requires each public listed company to reveal

2.1.3b. Stakeholders’ Theory

A stakeholder is any individual or group who can affect or is affected by the achievement of the organisation’s objectives (Mohiuddin & Karbari, 2010). Thus, stakeholders include shareholders, employees, suppliers, customers, creditors, communities in the vicinity of the entity's operations and the general public (including government). Most extreme proponents of this theory suggest that stakeholders include environment and future generations. Stakeholders' theory represents that the entity is a separate organisational entity and it is connected to different parties in achieving a broad range of purposes (Donaldson & Preston, 1995). The theory highlights interests of diverse groups and argues on the likelihood of favouring one group’s interest over that of the other (Jones & Wicks, 1999). Donaldson & Preston (1995) pointed out that managers are responsible for deploying their wise decisions and best efforts in obtaining benefits for all stakeholders. The board cannot overlook its responsibilities in protecting stakeholders’ interest (Wang & Dudley, 1992). Hillman, Keim & Luce (2001) found that conclusion of interested parties in the board merely improves their relation and performance. An active audit committee ensures better corporate governance practice in a firm that ultimately leads to the overall welfare of stakeholders.

Therefore, from the two theories considered above, stakeholders' approach recognises the benefit of the stakeholders as a whole as opposed to agency theory which considers only the interest of the shareholders. An active audit committee ensures better corporate governance practices in companies through financial reporting to protect the overall interest of stakeholders. The research anchored this work the stakeholders' theory. 2.2 Development of Hypotheses

2.2.1. Audit Committee Qualification

CAMA 2004 did not state the qualifications required of an audit committee member. This flaw in the law has led to less confidence in the committee report based on the fact that some of the members may have little or no idea about the company’s financial statement or company’s accounting policy. But with the nature of the responsibilities the Audit Committee is charged with, it is evident that the members of the committee would have to possess the apt qualifications to be able to function effectively. A high level of financial literacy is essential for an Audit Committee to supervise a company's financial control and to report adequately. This service requires the Audit Committee to have accounting knowledge to be able to understand the financial report and ensure compliance with regulatory requirements.

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whether or not it has a financial expert on the Audit Committee formal acknowledges this requirement.

H1. Audit committee members’ qualification does not have a significant effect on financial reporting of entities.

2.2.2. Audit Committee Independence

An indispensable attribute of an effective audit committee is independence from management. By providing an independent source of counsel to the board, Audit Committees play a key character in an organisation’s governance configuration. It is a most important practice for the preponderance of its members to be independent of the entity to ensure the Audit Committee’s independence. An independent audit committee member is a person who is not employed by or providing any services to, the organisation beyond his or her duties as a committee member. Independence of Audit Committee helps to ensure that management is transparent and will be held answerable to stakeholders (Treadway Commission, 1987; Cadbury Committee, 1992; Blue Ribbon Committee, 1999). The expectation is that independent Audit Committee members will be more objective and less likely to ignore possible deficiencies in the misappropriation and manipulation of financial reporting. Abbott, Parker & Peters, (2004) found evidence to sustain this interpretation within the perspective of financial reporting misstatements. After the passage of SOX in 2002, Audit Committees in the USA must consist exclusively of independent members to pre-approve audit and non-audit services and to set procedures for treatment of complaints connected to accounting and auditing issues. Beasley, Carcello, Hermanson, & Neal (2000) found that Audit Committee independence is considerably related to financial reporting quality since financial statements fraud is more likely to occur in entities with less Audit Committee independence.

The unique attribute of an Audit Committee is its independence. An Audit Committee is independent of the activities of management and this independence assists in ensuring that an Audit Committee acts in an objective, neutral manner free from any conflict of interest or inherent bias or undue external pressure. Where Audit Committee members are managers of the entity who are appointed by, and accountable to, the Chief Executive, the committee cannot be said to be entirely independent of management. The paper, therefore, states that, H2. Audit committee independence does not have a significant effect on financial reporting of entities.

2.2.3. Audit Committee Monitoring Function

The most efficient audit Committees are not only critically aware of their responsibilities but also completely understand and clinch to them, and recognise what is essential to fulfilling them effectively. The work of Audit Committee has been evolving in response to changes in the business milieu and first practices. The monitoring function of the Audit Committee ensures that there is active and collaborative involvement of all its principal champions. They include board of directors, independent external auditors, internal auditors and management and ensuring that this alliance occurs economically, effectively and efficiently which is essential to the success of an Audit Committee (KPMG, 2014).

The Audit Committee is in charge of supervision and monitoring the financial reporting process, including the risks and controls in that process. Internal controls, nonetheless, encompasses not only financial but also compliance with laws, regulations and operational controls. The Audit Committee should monitor the reliability of the financial statements and any other formal reports relating to the company’s financial performance before its publication. As part of this appraisal, the Audit Committee ought to ensure that its members are made conscious of accounting policy and disclosure issues and that this information is communicated to them time enough to facilitate suitable action to be taken as desirable. The Audit Committee should inquire of management and auditors concerning recommended audit adjustments and disclosure changes, those made by the administration and not by management; the accounting principles and the significant accounting policies adopted by the management; unusual dealings; and accounting provisions and estimates incorporated in the financial statements. An accurate understanding of all these factors is integral to meet its monitoring functions/responsibilities (KPMG, 2014). Hence H3. Audit committee monitoring service does not have a significant effect on financial reporting of entities.

III. Methodology

The study adopted survey design and collection of primary data was through the administration of 5-point Likert scale questionnaire. The study judgmentally chose 5 out of the 167 companies listed in the Nigerian Stock Exchange and also concentrated in Rivers State, Nigeria. The population of this study is the first set of listed companies established in Rivers State. The researchers chose these companies because of their geographical locations which make them readily available since they are situated at the hub of the city. The study also considered convenience as the researchers were able to distribute and collect questionnaire without much delay from respondents. These companies have a total population 233 administrative staff as follows: First Bank Plc (80), Total Nigeria Plc (69), John Holt Plc (24), First Aluminum Plc (12) and Flour Mills Nigeria Plc (48) in Rivers State. The sample size of this study was 145 (see appendix) staff. The study used Krejie and Morgan (1970) formula for sample size determination to derive the figure (see appendix). The allocation of the total sample size to the individual companies under survey was done by dividing the population of business by the total population multiplied by the total sample size.

To test for the relevance of the hypotheses regarding the effect of audit committee qualities on financial reporting, the researchers adapted the Regression Model. Hence, the study research involves an empirical analysis of the dependent and independent variables. Further insight on the relevance of each of the variables is presented as follows; the dependent variable for this study is financial reporting, while the independent variables are the independence of audit committee, qualification of audit committee members and monitoring function of the audit committee. Therefore, ordinary least squares regression analysis was the test statistic used to verify the hypotheses.

\[ FR = f(ACI, ACQ, ACM) \]

Where, \( FR \) = Financial Reporting
\( ACI \) = Audit Committee Independence
\( ACQ \) = Audit Committee Members’ Qualification

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ACM = Audit Committee Monitoring Function
Hence, FR is the dependent variable, while ACI, ACQ and ACM are the independent variables.

IV. RESULTS AND DISCUSSIONS

H1: Audit Committee independence does not have a significant effect on financial reporting.

Table 4.1.1 Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial reporting</td>
<td>2.2500</td>
<td>1.01889</td>
<td>258</td>
</tr>
<tr>
<td>Audit Committee</td>
<td>1.7500</td>
<td>1.09892</td>
<td>258</td>
</tr>
</tbody>
</table>

Table 4.1.2 Correlations

<table>
<thead>
<tr>
<th></th>
<th>Financial reporting</th>
<th>Audit Committee Independence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Correlation</td>
<td>1.000</td>
<td>.844</td>
</tr>
<tr>
<td>Audit Committee Independence</td>
<td>.844</td>
<td>1.000</td>
</tr>
<tr>
<td>Sig. (1-tailed) Financial reporting</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>Audit Committee Independence</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>N</td>
<td>Financial reporting</td>
<td>258</td>
</tr>
<tr>
<td>Audit Committee Independence</td>
<td>258</td>
<td>258</td>
</tr>
</tbody>
</table>

Table 4.1.3 Model Summaryb

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.844a</td>
<td>.712</td>
<td>.707</td>
<td>.55130</td>
<td>.309</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Audit Committee Independence
b. Dependent Variable: Financial Reporting

Table 4.1.4 AVOVAb

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
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<tbody>
<tr>
<td>1 Regression</td>
<td>43.622</td>
<td>1</td>
<td>43.622</td>
<td>143.525</td>
<td>.000a</td>
</tr>
<tr>
<td>Residual</td>
<td>17.628</td>
<td>256</td>
<td>.304</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>61.250</td>
<td>257</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Audit Committee Independence
b. Dependent Variable: Financial Reporting
Table 4.1.5 Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>T</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Std Error</td>
<td>Beta</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (Constant)</td>
<td>.881</td>
<td>.135</td>
<td>6.500</td>
<td>.000</td>
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<td>Audit Committee</td>
<td>.782</td>
<td>.065</td>
<td>11.980</td>
<td>.000</td>
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<tr>
<td>Independence</td>
<td>.884</td>
<td>.884</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Dependent Variable: Financial Reporting

Source: Researchers computations

The regression sum of squares (43.622) is greater than the residual sum of squares (17.628), which indicates that the model explained more of the variation in the dependent variable. The significance value of the F statistics (0.000) is less than 0.05, which means that the explained variation by the model is not due to chance. The correlation coefficient R, which has a value of 0.844, indicates that there is a significant effect of audit committee independence on financial reporting. R square, the coefficient of determination, shows that the model explained 71.2% of the variation in financial reporting. With the linear regression model, the error of estimate is low, with a value of about 0.55130. The Durbin Watson statistics of 0.309, which is not more than 2, indicates there is no autocorrelation. Audit committee independence coefficient of 0.844 indicates a significant effect of audit committee independence on financial reporting, which is statistically significant (with t = 6.500). Therefore, the study rejected the null hypothesis and accepted the alternative hypothesis. Thus audit committee independence has a significant effect on financial reporting.

H2: Audit Committee member qualification does not significantly affect financial reporting

Table 4.2.1 Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial reporting</td>
<td>1.8500</td>
<td>1.05485</td>
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</tr>
<tr>
<td>Audit Committee Member</td>
<td>2.5333</td>
<td>1.41980</td>
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</tr>
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<td>Qualification</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Table 4.2.2 Correlations

<table>
<thead>
<tr>
<th></th>
<th>Financial reporting</th>
<th>Audit Committee Independence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Correlation</td>
<td>Financial reporting</td>
<td>.869</td>
</tr>
<tr>
<td>Audit Committee Member</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Qualification</td>
<td>.869</td>
<td>.100</td>
</tr>
<tr>
<td>Sig. (1-tailed)</td>
<td>Financial reporting</td>
<td>.000</td>
</tr>
<tr>
<td>Audit Committee Member</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Qualification</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>Financial reporting</td>
<td>258</td>
</tr>
<tr>
<td>Audit Committee Member</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Qualification</td>
<td>258</td>
<td>258</td>
</tr>
</tbody>
</table>
Table 4.2.3  
Model Summary\(^b\)

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.869(^a)</td>
<td>.755</td>
<td>.751</td>
<td>.52616</td>
<td>.273</td>
</tr>
</tbody>
</table>

\(^a\) Predictors: (Constant), Audit Committee Member Qualification  
\(^b\) Dependent Variable: Financial Reporting

Table 4.2.4  
AVOVA\(^b\)

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Regression</td>
<td>49.593</td>
<td>1</td>
<td>49.593</td>
<td>179.134</td>
<td>.000(^a)</td>
</tr>
<tr>
<td>Residual</td>
<td>16.057</td>
<td>256</td>
<td>.277</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>65.650</td>
<td>257</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) Predictors: (Constant), Audit Committee Member Qualification  
\(^b\) Dependent Variable: Financial Reporting

Table 4.2.5  
Coefficients\(^a\)

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Stabandardized Coefficients</th>
<th>T</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>B</td>
<td>Std Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>Audit Committee Independence</td>
<td>.214</td>
<td>.140</td>
<td>31.531</td>
<td>.031</td>
</tr>
<tr>
<td></td>
<td>.646</td>
<td>.048</td>
<td>.869</td>
<td>13.384</td>
</tr>
</tbody>
</table>

\(^a\) Dependent Variable: Financial Reporting  
\(^b\) Source: Researchers computations

The regression sum of squares (49.593) is greater than the residual sum of squares (16.057), which indicates that the model explained the model explains more of the variation in the dependent variable. The significant value of the F statistic (0.000) is less than 0.05, which means that the model explanation of the change is not due to chance. R, the correlation coefficient which has a value of 0.869, indicates that there is a significant effect of Audit Committee member qualification on financial reporting. R square, the coefficient of determination, shows that 75.5% of the variation in financial reporting is explained by the model. With the linear regression model, the error of estimate is low, with a value of about 0.52616. The Durbin Watson statistics of 0.273, which is not more than 2, indicates there is no autocorrelation. The Audit Committee member qualification coefficient of 0.869 indicates a significant effect of Audit Committee member qualification on financial reporting, which is statistically significant (with t = 31.531). Therefore, the null hypothesis should be rejected and the alternative hypothesis accordingly accepted. Thus Audit Committee member qualification significantly affects financial reporting.  
H3: Monitoring function of Audit Committee does not significantly affect financial reporting
### Table 4.3.1 Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial reporting</td>
<td>1.6500</td>
<td>1.03866</td>
<td>258</td>
</tr>
<tr>
<td>Monitoring Function of Audit Committee</td>
<td>2.4000</td>
<td>1.36791</td>
<td>258</td>
</tr>
</tbody>
</table>

### Table 4.3.2 Correlations

<table>
<thead>
<tr>
<th></th>
<th>Financial reporting</th>
<th>Monitoring Function of Audit Committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Correlation</td>
<td>1.000</td>
<td>.864</td>
</tr>
<tr>
<td></td>
<td>.864</td>
<td>1.000</td>
</tr>
<tr>
<td>Sig. (1-tailed)</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>258</td>
<td>258</td>
</tr>
</tbody>
</table>

### Table 4.3.3 Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.864a</td>
<td>.746</td>
<td>.742</td>
<td>.52801</td>
<td>.354</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Monitoring Function of Audit Committee  
b. Dependent Variable: Financial Reporting

### Table 4.3.4 AVOVA

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>Df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Regression</td>
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<td>47.480</td>
<td>170.301</td>
<td>.000a</td>
</tr>
<tr>
<td>Residual</td>
<td>16.170</td>
<td>256</td>
<td>.279</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>63.650</td>
<td>257</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Monitoring Function of Audit Committee  
b. Dependent Variable: Financial Reporting

### Table 4.3.5 Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>T</th>
<th>Sig.</th>
</tr>
</thead>
</table>
The regression sum of squares (47.480) is greater than the residual sum of squares (16.170), which indicates that the model explained more of the variation in the dependent variable. The significance value of the F statistics (0.000) is less than 0.05, which means that the difference as explained by the model is not due to chance. R, the correlation coefficient which has a value of 0.864, indicates that there is a significant effect of monitoring function of Audit Committee on financial reporting. R square, the coefficient of determination, shows that 74.6% of the variation in financial reporting is explained by the model. With the linear regression model, the error of estimate is low, with a value of about 0.52801. The Durbin Watson statistics of 0.354, which is not more than 2, indicates there is no autocorrelation. The monitoring function of Audit Committee coefficient of 0.864, shows a significant effect of oversight function of Audit Committee on financial reporting, which is statistically significant (with t = 9.549). Therefore, the null hypothesis should be rejected and the alternative hypothesis accordingly accepted. Thus monitoring function of Audit Committee has significant effects on financial reporting.

V. DISCUSSION ON FINDINGS

Audit committee independence is a key factor in enhancing its quality in preventing misstatements in financial reports. One of the duties of the audit committee is to give unbiased reviews of financial statements, and independence of the audit committee can improve the quality of financial reporting. This study found out that audit committee independence has a significant effect on financial reporting. This finding is in line with what was observed in the survey carried out by Appah&Emeh (2013). Their results suggested that audit committee independence is significantly related to timeliness of financial reports. Also, Habbash (2010) found out that lack of independence of the audit committee can severely affect the quality and credibility of financial reporting.

Audit Committee member qualification is an integral aspect of Audit Committee that should not be ignored even though the law did not state the requirements. Any person qualified to be a member of Audit Committee should possess an in-depth knowledge about the entity primarily information on the financial reporting and disclosure processes. Members should be knowledgeable of the critical accounting principles and policies adopted by management. Therefore, the study found out that Audit Committee member qualification significantly affects financial reporting. This finding is in line with the research carried out by Okpala (2012). According to him, financial literacy of all members and adequate understanding of the industry in which the company operates are necessary for the proper discharge of duties. The author suggested that at least one member should have financial expertise and professional qualification of recognised professional accounting bodies.

The monitoring function of Audit Committee has a significant effect on financial reporting as shown in the result above. Audit Committee monitoring service encompasses monitoring the internal control system and procedure of the company and overseeing regulatory compliance of financial reporting standards among others. They also monitor and assess the role of and effectiveness of the internal audit function in the overall context of company's risk management system. It shows, from the result shown above, that the Audit Committee of the companies under study is active in their monitoring function responsibility.

Conclusion and Recommendations

Given the findings stated above, the study has demonstrated that there is a significant effect of Audit Committee quality on financial reporting of companies in Nigeria. It has established the need for regulatory authorities' to capture the qualifications of members of the Audit committed in the law regulating operations of entities in Nigeria. Therefore, by the empirical result, this research concludes that Audit Committee quality has a significant effect on financial reporting and makes the following recommendations:

Management should endeavour to steer clear from the functions and responsibilities of the Audit Committee in order not to influence them to be biased in the financial reporting process of the company. Therefore, to perform effectively and efficiently, Audit Committees must be independent of management as this will allow both internal and external auditors to remain free of undue influence and interference from corporate executives.
The regulatory authorities and policymakers should still amend the Companies and Allied Matters Act, 2004 to incorporate the qualification required of an Audit Committee member, the degree of financial literacy must be expressly specified. At least one or two members of the Audit Committee should have an accounting knowledge for the proper understanding of financial reporting and improved compliance with regulatory requirements.

Companies should engage the services of a financial consultant to train members of Audit Committee on areas where in-depth knowledge is required especially on the application of new accounting standards which will aid financial reporting process of the company.

Audit Committee of a company should segment the monitoring process by identifying areas that are vulnerable to risk. Audit Committee should also consider the management representation (or its equivalent) and monitor management’s responsiveness to the external auditor’s findings and recommendations.

REFERENCES


Appendix A

Allocation of Sample Size

<table>
<thead>
<tr>
<th>COMPANIES</th>
<th>POPULATION</th>
<th>SAMPLE SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Bank Nigeria Plc</td>
<td>80</td>
<td>50</td>
</tr>
<tr>
<td>Total Nigeria Plc</td>
<td>69</td>
<td>43</td>
</tr>
<tr>
<td>John Holt Plc</td>
<td>24</td>
<td>15</td>
</tr>
<tr>
<td>First Aluminum Nigeria Plc</td>
<td>12</td>
<td>7</td>
</tr>
<tr>
<td>Flour Mills Nigeria Plc</td>
<td>48</td>
<td>30</td>
</tr>
<tr>
<td>TOTAL</td>
<td>233</td>
<td>145</td>
</tr>
</tbody>
</table>

Appendix 2

Sample Size Determination

The Krejcie and Morgan (1970) formula used in determining the total sample size is given below:

\[ S = \frac{X^2NP(1-P)}{ME^2(N-1) + X^2P(1-P)} \]

Where, 
- \( S \) = Sample size.
- \( X^2 \) = Chi – Square for the specific confidence level at 1 degree of freedom.
- \( N \) = Population Size.
- \( P \) = Population proportion (assumed to be 0.50).
- \( ME \) = Margin of Error (assumed to be 0.05)

Appendix 3.

QUESTIONNAIRE

1. To what extent does audit committee independence affect timely production of financial report in your company?
   (a) Very High Extent  [ ] (b) High Extent  [ ] (c) Indifferent  [ ]
   (d) Low Extent  [ ] (e) Very Low Extent  [ ]
2. To what extent does audit committee independence ensure consistency of financial report in your company?
   (a) Very High Extent  (b) High Extent  (c) Indifferent
   (d) Low Extent  (e) Very Low Extent

3. Audit committee independence ensures that financial reports are comparable in your company
   (a) Strongly Agree  (b) Agree  (c) Undecided
   (d) Disagree  (e) Strongly Disagree

4. To what extent does audit committee independence influence presentation of financial report?
   (a) Very High Extent  (b) High Extent  (c) Indifferent
   (d) Low Extent  (e) Very Low Extent

5. Audit committee monitoring function improves consistency of financial reporting in your company
   (a) Strongly Agree  (b) Agree  (c) Undecided
   (b) Disagree  (e) Strongly Disagree

6. To what extent does audit committee monitoring function enhance timely production of financial report in your company?
   (a) Very High Extent  (b) High Extent  (c) Indifferent
   (b) Low Extent  (e) Very Low Extent

7. Audit committee monitoring function boosts presentation of financial reporting in your company.
   (a) Strongly Agree  (b) Agree  (c) Undecided
   (c) Disagree  (e) Strongly Disagree

8. To what extent does audit committee monitoring function ensures comparability of financial reports of your company?
   (a) Very High Extent  (b) High Extent  (c) Indifferent
   (d) Low Extent  (e) Very Low Extent

9. Audit committee members’ qualification positively affects their functions and financial statement presentation in your company
   (a) Strongly Agree  (b) Agree  (c) Undecided
   (e) Disagree  (e) Strongly Disagree

10. To what extent does audit committee members’ qualification enhance timely production of financial report in your company?
    (a) Very High Extent  (b) High Extent  (c) Indifferent
    (d) Low Extent  (e) Very Low Extent

11. Audit committee members’ qualification positively enhances their functions and consistency in application of accounting principles in your company
(a) Strongly Agree  □  (b) Agree  □  (c) Undecided □
(d) Disagree □  (e) Strongly Disagree □

12. Audit committee members’ qualification positively improves their functions and comparability of financial statements in your company
(a) Strongly Agree  □  (b) Agree  □  (c) Undecided □
(d) Disagree □  (e) Strongly Disagree □

THANK YOU
Agriculture Credit Market in Odisha: A Source of Sustainable Livelihood for the Farmer

Jeeban Jyoti Mohanty

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Abstract- Agriculture continues to be the backbone of the state’s economy in Odisha. Nearly 58 percent of the rural households depend on agriculture for their primary means of livelihood, but this sector continues to be subsistence oriented and susceptible to natural shocks such as droughts and floods. As agriculture depends on monsoon, a major segment of this population does not have sufficient income even to meet their daily expenses and for them the possibilities of savings and investment are almost stagnant. They require credit in their day to day life, to purchase agricultural inputs and adopt modern technology. Thus, timely and adequate quantum of agricultural credit is critical for the socio-economic development of the agricultural farmer.

The present paper is an attempt to explore the agricultural credit market in Odisha, which is a powerful tool for enhancing production and productivity and ensuring sustainable livelihood for the countryman. Further, the paper highlights the strategies adopted by the Reserve Bank of India (RBI), National Bank for Agriculture and Rural Development (NABARD) to increase the agricultural credit facilities in the state. The various tools of rural credit are analysed in details. This study utilised secondary sources of information such as RBI and NABARD report on Financial Inclusion, agenda of various issues of State Level Bankers Committee (SLBC), Odisha meeting and State Economic Survey Report etc. Moreover the study has also explored various other sources, for instance MFIN Micrometer Report and Odisha inclusive finance report, etc.. The analysed data are presented based on objective of the research in the form of tables, which are described, interpreted and conclusion drawn. The study gives an ample opportunity to understand the need and sources of agricultural credit market in Odisha. It further unbolts exploration in terms of issues and challenges of the rural credit market in the state. The study has revealed that agricultural credits can serve as a tool for providing a sustainable livelihood for millions poor farmers in the state. Several organisations like NABARD, RRBs, cooperative bank and Microfinance Institutions, etc. are playing a major role in providing agricultural credit facilities to the needy. The study suggests that the cooperative credit system need to be reinvigorated and the priority sector lending norms should be strengthened. Furthermore the study has also recommended that every district should have a vision plan encompassing all aspects of financial services to farmers and pursuing certain minima of financial services and livelihood support services. But in spite of several efforts put up by various organisations to increase the agriculture credit facilities, several challenges will prevail in years to come.

Index Terms- Rural credit, Institutional Credit Agency, Crop loan, MFIs, SHG-Bank Linkage Programme and Cooperative credit System

I. INTRODUCTION

India is an agrarian economy; where above 58 percentages of rural households depend upon agriculture for their primary means of livelihood. Agriculture contributes 17.4 percentages towards Gross Domestic Product (GDP) and employs 2/3 of labour to the total work force1. Though it contributes for majority of the people as a primary source of livelihood and added great extent in GDP, but fails to provide optimum production of the farm land. Basically landholding pattern, irrigation facilities, marketing system, agricultural inputs, lack of finance has kept them in back foot point. Landholding pattern is very much pathetic because 25 percentages of the total cultivable land under the clutches of majority (75%) of the people and 75 percentages of cultivable land are in the name of 25 percentages of the landlord2. Poor irrigation facilities also added fuel in low production. Because of small pieces of land and lack of finance, farmers are unable to invest in agricultural inputs. Agricultural inputs include modern technologies, fertilizers, manures, and quality seeds. These agricultural inputs are very much required for increasing the productivity of the land which is the need of an hour. Increasing the productivity of the land depends on the investment on agricultural inputs packages. It requires huge investment which is not possible on the part of poor farmers. After 70 years of independence still nearly 27.5 percentages of people are living in BPL category3.

The term “Credit” refers to a particular sub-set of financial services which provides small loans to very poor and tribal families, most often without any collateral. The provision of credit and generation of savings has long been recognized as an essential element in any rural development strategy. Credit plays a crucial role in the modernization of agriculture, but its role in the fight against rural poverty has seldom been recognized (Islam, Siddiqui and Karim, 2014) . In one hand the majority of the people depend on agricultural activities and on the other hand, they are lacking in capital for investment which compels them to knock the door of any financial institutions either formal or informal.

1 Economic Survey, 2015-16
2 www.nic.in
3 Ministry of Social Justice and Empowerment, GoI

www.ijsrp.org
Formal institution means registered under the banking regulation act 1949 and following the norms, principles of Reserve Bank of India. These institutions are cooperative banks, commercial banks, regional, rural banks, NBFCs etc. as per the circular and guideline of the RBI, these institutions will act upon it. The formal institutions are very much strict on their lending principles. The documentation process and without mortgages the formal institutions will not sanction a single pie to the farmers. The quantum of loan depends upon the value of assets that a farmer wants to keep with the bank. It is noteworthy to mention that interest is charged as the purpose of the loan. For documentation farmers take lots of pain for collecting required documents from various departments. As it is mentioned that the majority of the people are small farmers and poor they cannot keep any mortgages, but as per the banking principles without fulfilling these required criteria’s they cannot avail loan. However, in few cases where farmers meet the requirements of the institutions, but failed to access it in time because of the lengthy loan sanctioning process. When they get it the purpose of that loan might have met out in some other sources. Three things are very important in delivering credit to the farmers for agricultural purposes such as the documentation process, quantum of loan and timely disbursement, falling of these compels the farmers to knock the door of informal sources for availing it.

Informal financial institution means without any documentation, record and not adhering norms, principles, guideline set by RBI. The farmers avail loans from the informal sources like moneylender, merchants, bittle shopkeeper, relatives and friends, etc. in fact, in availing loan from these sources, farmers get a certain benefit like required less document, face value, no mortgage, quantum of loan is high, door step services and timely credit. Face value plays a very important role in sanctioning loan. It means if you are known to the respective persons all facilities will be given to him. The interest rate is also depends upon the person who is taking a loan and it varies from sources to sources. But definitely, it is a bit higher than the formal institutions.

Thus, the concern with the inadequacy of agriculture credit has had more than a century of tortuous history. The agricultural credit system (Chart-1) as it has emerged has been a product of both evolution and intervention and symbolises the system’s response to the stimuli from continuing dissatisfaction with credit delivery. The concern for food security and the need for building up buffer stocks, which guided the Green Revolution, created both enhanced and diversified one of credit requirements for agricultural productions in India, a “supply-leading approach” to the institutional development for agricultural credit has been followed (Mohan, 2004).

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4 Monetary Economics: institutions, theory, and policy by S. B. Gupta
II. REVIEW OF LITERATURE

Agricultural credit, being a vital sector of national importance, has claimed governmental and academic attention quite often. It has been analysed under different disciplines for a long time.

The All India Rural Credit Survey Committee headed by Gorwala (1954) made a study on rural credit. This nation-wide survey was carried on at the institutional level as well as at the cultivator level. It was observed that about 70 per cent of the total credit requirements of the agriculturists were supplied by the professional moneylenders. The government and the co-operatives have supplied just 3.3 and 3.7 percent respectively. The committee identified that a bulk of institutional credit was used by the big farmers. The co-operative credit societies lent loans against the land alone and the co-operative credit institutions were weak both at the grass root and central levels. The committee recommended “Integrated Scheme of Rural Credit” to set right the bottlenecks in co-operative institutional credit.

Mishra and Mishra (2007) in their study on “Institutional finance and farmer indebtedness in Orissa: evidence from village study” have identified that the large farmers by their political influence get access to a considerable amount of credit, but the small and marginal farmers are found to divert the productive credit for other purposes and very often they are alleged not to have repaid the amount intentionally.

Kailash (2005) attempted to study on agricultural credit in India doing and undoing’s noted that both formal and informal sources of credit are important in the Indian context. However, the significances of formal credit institutions in terms of credit deliveries for the agricultural sector have increased over the years and it also noted that the share of cooperative credit institutions in total agricultural credit has declined in the last decades whereas the share of commercial banks and RRB have increased. The study revealed that the large farmers had taken more than 75 per cent of total credit from institutional sources, i.e., co-operatives 62 per cent and commercial banks 13 per cent, when compared with the other two size groups of farmers, nearly 82 per cent and 71 per cent of the total credit taken by small and medium sample farmers respectively, are from non institutional sources, i.e., relatives and money lenders respectively, while the same was found by large group of farmers accounting less than 25 per cent.

Mishra, R.K. and S. Pattanaik (2005) attempted to study the impact of institutional finance of farm income and productivity, a case study of Orissa. The results revealed that among the institutional sources role of co-operatives was quiet commendable having the share of 39.53 per cent followed by commercial banks 19.83 per cent and RRB with 6.91 per cent, the small and large farmers were borrowed about 75 and 81 per cent of the total finance. Further it is evident that out of total borrowings, crop loan constituted about 68 per cent, as against term loan 32 per cent.

Singh, S and M.S. Toor (2005) made a study on cash in benefits of the Kisan Credit Card scheme. The results revealed that major sources of the farm credit in the case of all the farm classes, was co-operative credit almost all these respondents were in the practice of availing of credit in kind in the form of fertilizer and also in pesticides. The average amount availed by per borrower showed an increasing trend with increase in the farm size.But the number of medium farm KCC beneficiaries was comparatively lower at 65.75 per cent. Besides accessing cooperative credit 30.77 percent of the small and 28.95 percent of
the medium KCC beneficiaries were observed to be still in the grip of money lenders.

III. METHODOLOGY OF THE STUDY

Looking the various aspects of the agricultural credit market in Odisha and the existing financial market scenario in the state, a study was required to understand the need and source of agricultural credit market in the state and its impact on agricultural productivity. More than this the study had also focused on the status, opportunity and challenges of the various credit market in Odisha. There are various explicit and implicit factors related to this issue. With this backdrop, the objective of our study had been stated more precisely as follows

i. To examine the nature, need and source of Agricultural credit market in Odisha.
ii. To explore the status, opportunity and challenges of the various credit market in Odisha.
iii. To suggest certain viable measures to be adopted for timely availability of credit to the agricultural farmers and its proper utilization.

Sources of Data: The study has utilised secondary sources of information such as Reserve Bank of India report on Financial Inclusion, Reports of various financial institutions like NABARD, Agenda of SLBC, Odisha meeting. Moreover the study has also explored the various other sources like MFIN Micrometer, Cooperative Credit Systems, etc. The analysed data is presented based on the objectives of the study in the form of tables, which are described, interpreted and conclusions drawn.

IV. KEY CHALLENGES IN AGRICULTURAL CREDIT

Generally there are three key challenges in agricultural markets in India, i.e (i) Highlight the structures of existing agriculture credit markets and its role in order to bring out the insufficiency in terms of performance, (ii) Whether the existing credit markets full fill the needs of the rural population. Furthermore, whether the formal source of credit has helped in bridging the credit gaps of the small farmers, (iii) Problems related to adverse selection and lack of incentives to guard against the risk in an agricultural credit, creates problems for formal institutions in lending money to farmers.

NEED FOR AGRICULTURE CREDIT

The need of credit for agriculture can hardly be over emphasis where its productivity is still low due to financial constraints. In this context, All Rural Credit Survey has observed: “Agricultural credit is a problem when it cannot be obtained; it is also a problem when it can be had but in such a form that on the whole it does more harm than good. In India it is this twofold problem of inadequacy and unsuitability that is perennially presented by agricultural credit”. Undoubtedly, an Indian farmer is not able to make the maximum use of his time, labour and productive capacity of his land because of the lack of adequate financial facilities. Farmers need credit for two purposes such as

i. Productive: Productive purpose means investment of that amount and expecting return out of it. Investment of productive loan on agriculture refers agricultural land development work, purchasing modern technologies, seeds, fertilizers, etc. these agricultural packages will help in enhancing the productivity of the land. Formal financial institutions are interested in financing for this purpose because it is expected better repayment performance from the farmers.

ii. Unproductive: Unproductive purposes mean return is not expected from that investment. Investment on marriage, social gathering, festivals, constructing houses, purchasing gold, etc. are treated as unproductive purposes. In economic point of view, it may be unproductive, but development point of view, it is very much essential on the part of human life. Being a social animal you need to go along with the society at any point of time you cannot detach yourself from it. But formal financial institutions do not extend its support for encouraging investment on unproductive purposes, because it looks it as a business point of view, not social phenomena. But in case of money lender they lent money for any purposes without any hesitation.

Agricultural activities is the major sources of the farmer income in the state, but the land holding pattern and the methods they opt for cultivation, does not provide substantial output to manage their family round the year resulted in knocking at the door of landlords or merchants, etc. They use traditional way of cultivation using traditional equipments, methods, etc. In one hand they are unskilled and on the other side they lack in capital for investment on agrarian packages. These are responsible for low production of the land. In addition to that there are lots of financial institutions break out in the remote places, but still then it fails to provide any substantial result in delivering credit to the agricultural farmer. They are unable to access the formal financial institutions because of unable to produce the required documents and the assets that they demand. However, for availing agriculture loan they need to produce patta and tax receipt on that land which is in their name only, but in fact that land might have belongs to their eternal father. These are few concerns bend the farmer backbone for accessing institutionalized credit for which they knock at the door of informal sources.

SOURCES OF AGRICULTURAL FINANCE

Saving generation and availability of credit plays a crucial role in rural development. It is well accepted that credit always plays an important role in modernization the agriculture, but its role of fight against rural poverty has seldom been recognized. In developing countries like India formal financial institutions, whether public and private have avoided rural credit for various reasons such as low financial credibility and the opportunity costs. Further rural financial services have mostly been controlled by moneylenders, who are able to use their large endowment base and influence within the local power structure to secure loans at high advantaged, terms. Credit policies are also generally concentrated on land based agricultural production programmes, neglecting off-farm in activities in which the poor are mainly engaged (Rao and Priyadarshini, 2013). The informal

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5 Agriculture and Rural development in India since 1947, Dr. Chandra Sekhar Prasad

www.ijsrp.org
sector workers have mostly been excluded from the financial services either because they were not available or simply because they were not conceded creditworthy. There is a myth that poor are not credit worthiness and they are ignorant of the basic principles of sound money management.

**FORMAL AND INFORMAL AGRICULTURAL CREDIT SOURCES**

Conventionally, the institutional finance in India has been serving only the needs of the commercial sector and meeting the loan requirements of middle and upper income people. As far as the formal financial institutions are concerned, there are Development financial institutions like NABARD, SIDBI, Commercial Banks, Regional Rural Bank (RRB) and Co-operative Banks (CBs), etc. The Government has taken several initiatives to strengthen the institutional rural credit system. The rural branch network of commercial banks has been expanded and certain policy prescriptions imposed in order to ensure greater flow of credit to agriculture and other preferred sectors (Rao and Priyadarshini, 2013).

In the beginning plan period the moneylenders are continuing to dominate and nearly 92.8 percent of the rural households depend on informal source of credit. After 1981, the presence and role of commercial banks and cooperative were highly commendable. It appears that the large number of branches that was set up by various commercial banks in the 1970s and the subsequent introduction of rural banking schemes have driven the commercial banks to assume the role of principal credit agency in rural areas (Pradhan, 2013). At the all India level, among the formal credit institutions, commercial banks and cooperative societies were playing a key role in meeting the rural credit. These two institutions together, have 91 percent shared of the entire amount in the rural sector. In 2002, share of cooperative societies stood at 27.3 percent, whereas share of commercial banks is 28.9 percent (Table-1).

| Table 1: Break up of institutional and Non-Institutional Rural Credit (in %) |
|---------------|---|---|---|---|---|---|---|---|
| **Institutional Agencies** |     |     |     |     |     |     |     |     |
| Government   | 3.3 | 5.3 | 6.7 | 4 | 5.7 | 2.3 | 7.8 | 1.3 |
| Co-Op. Society | 3.1 | 9.1 | 20.1 | 28.6 | 18.6 | 27.3 | 21.3 | 28.9 |
| Commercial Bank incl. RRBs | 0.8 | 0.4 | 2.2 | 28 | 29 | 24.5 | 30.2 | 30.7 |
| Insurance    | - | - | 0.1 | 0.3 | 0.5 | 0.3 | 0.8 | 0.1 |
| Provident Fund | - | - | 0.1 | 0.3 | 0.9 | 0.3 | 0.5 | 0 |
| Others Institutional agencies | - | - | - | - | 9.3 | 2.4 | 1.7 | 3 |
| **Non-Institutional Agencies** | 92.8 | 85.2 | 70.8 | 38.8 | 36 | 42.9 | 37.7 | 36 |
| Landlord     | 1.5 | 0.9 | 8.6 | 4 | 4 | 1 | 5.7 | 0.4 |
| Agriculture Moneylender | 24.9 | 45.9 | 23.1 | 8.6 | 6.3 | 10 | 8.1 |
| Professional Moneylender | 44.8 | 14.9 | 13.8 | 8.3 | 9.4 | 19.6 | 10.1 | 29.6 |
| Traders and Commission Agents | 5.5 | 7.7 | 8.7 | 3.4 | 7.1 | 2.6 | 4.8 | 2.8 |
| Relatives and Friends | 14.2 | 6.8 | 13.8 | 9 | 6.7 | 7.1 | 4.4 | 4.3 |
| Others       | 1.9 | 8.9 | 2.8 | 4.9 | 2.5 | 2.6 | 4.6 | 1.7 |
| **Total**    | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

Sources: All India Debt and Investment Survey various series and NSSO.

On the other hand the share of all non-institutional credit agencies in the loan outstanding of the agriculture, farmers declined from 70.8 percent in 1971 to 38.8 percent in 1981, but from 1991 to 2002, there are only 3 percentage points (Table-1). It is found that dependency on agriculture money lenders was sharply declined from 45.9 percent in 1961 to 8.1 percent in 2010 but in case of professional moneylenders it raised from 14.9 percent in 1961 to 29.6 percent in 2013. It was observed that importance of relatives and friends gradually declined as a source of credit. The share fell from 14.2 percent in 1951 to 4.3 percent in 2013. From non-institutional credit agencies, money lenders – both professional and agriculture were found to be an important source of finance in rural areas.

**PROFILE OF THE STATE OF ODISHA**

Odisha is the eleventh largest State with 3.4% of the country’s population. As per the provisional Census figure of 2011, the State has a population of 41.95 million (male-21.20 million, female -20.75 million) (Table-2). The sex ratio of the State is an important indicator for the analysis of the Human Development Index in these areas. A comparison with national average also puts the performance of the State in perspective with the country as a whole.
Table 2: Comparative State Demographic Features

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Parameter</th>
<th>Odisha [2011]</th>
<th>India [2011]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Population in Million</td>
<td>41.95</td>
<td>1210</td>
</tr>
<tr>
<td></td>
<td>(a) Male</td>
<td>21.2</td>
<td>624</td>
</tr>
<tr>
<td></td>
<td>(b) Female</td>
<td>20.75</td>
<td>568</td>
</tr>
<tr>
<td>2</td>
<td>Decadal Growth Rate</td>
<td>13.97</td>
<td>17.6</td>
</tr>
<tr>
<td>3</td>
<td>Population Density (Per sq km)</td>
<td>269</td>
<td>382</td>
</tr>
<tr>
<td>4</td>
<td>Literacy Rate (%)</td>
<td>73.05</td>
<td>74.04</td>
</tr>
<tr>
<td>5</td>
<td>Sex Ratio</td>
<td>978</td>
<td>943</td>
</tr>
<tr>
<td>6</td>
<td>Rural Population (%)</td>
<td>83</td>
<td>68.84</td>
</tr>
<tr>
<td>7</td>
<td>SC Population (%)</td>
<td>17.13</td>
<td>16.6</td>
</tr>
<tr>
<td>8</td>
<td>ST Population (%)</td>
<td>22.85</td>
<td>8.6</td>
</tr>
<tr>
<td>9</td>
<td>Female Work Participation</td>
<td>32.15</td>
<td>25.6</td>
</tr>
<tr>
<td>10</td>
<td>HDI</td>
<td>0.362</td>
<td>0.467</td>
</tr>
<tr>
<td>11</td>
<td>Poverty Ratio (2009-10)</td>
<td>37</td>
<td>29.8</td>
</tr>
</tbody>
</table>

Source: Census of India, 2011

Odisha has been ranked as the most backward states by the panel headed by Dr. Raghuram Rajan. The panel has proposed a new index of backwardness to identify States that require special assistance. The new index is composed of 10 equally weighted indicators for monthly per capita consumption expenditure, education, health, household amenities, poverty rate, and female literacy, the percentage of the Scheduled Caste/Scheduled Tribe population, urbanization rate, financial inclusion and physical connectivity.

CONCERN AND CHALLENGES OF THE STATE

Agriculture and allied sectors continue to be subsistence oriented and susceptible to natural shocks such as droughts and floods. Agriculture is mostly traditional, rain fed and use of technology and modern agricultural practices is minimal. The growth of the sector has been around 3%. The Schedule Castes (17.13%) and Schedule Tribes (22.85%) constitute 39.98% of the population as per 2011 census. The adverse socio-economic condition, as it is, of such a large chunk of population presents a major challenge in development of the state. There is a considerable gap between the State’s real per capita income and the national per capita (8% approx.). Left Wing Extremism (LWE) has affected nineteenth districts; this has an impact on both security and development, and thus has to be tackled with specific strategies. Faster and balanced economic development with focus on critical infrastructure is warranted. The State needs to improve governance, delivery of public services, investment, recovery and regulatory environment.

STATUS OF AGRICULTURE IN ODISHA

As per the Economic survey of Odisha, Agriculture formed 15.4 percent of the GSDP of the state in 2014-15 and it was 16.3 percent in 2013-14. The GDP of Odisha is growing at a pace slower than the national average. Slower growth can be partly attributed to lower or negative growth in agriculture in the state. Also the per capita income of Odisha is INR61,678 while all India average is INR 81,805. It is also important to note that Odisha has one of the highest levels of poverty in the country. As there is not enough scope for non-farm income, agriculture stagnation has serious livelihood implications for the small and marginal farmers and the agricultural labourers. The potential for agricultural development of Odisha is, however immense. It has good water potential for growing groundnut and jute. There is also a lot of scope for agro industries for value addition in the agriculture sector which has largely remained underdeveloped (Khan, 2008).

AGRICULTURE IN ODISHA: ISSUES AND CHALLENGES

The agriculture in Odisha is facing several challenges which includes (a) Low productivity due to fragmentation of land holding pattern, (b) Mostly focused on cereal production, (c) lack of research and development support, (d) One third of agriculture land is alkaline or saline,(e) Insufficient and improper use of inputs, (f) Credit flow is skewedly distributed across the districts, (f) Highly fragmented markets, (g) Microfinance/SHGs initiatives not focusing on agriculture, and (h) Low use of Information and digital technology in agriculture.

Scope of Agriculture in Odisha: (i) There are ample scope for crop diversification considering the variety of agro climatic zones in the state, (ii) The low use of fertilizer can be strengthened as large areas can be brought under organic agriculture which is characterized by growing demand and commands a premium price in the global and domestic markets, (iii) Agro processing and agribusiness have good value addition and employment generation potential. In the long term, agriculture would not be able to sustain the nearly 60 percent of the population involved in agriculture and hence, there is need to create more opportunities in the agro industries sector (Khan, 2008).

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6 NITI Aayog, 2014-15
7 Odisha Economic Survey, 2016-17
CURRENT TREND OF RURAL CREDIT IN ODISHA

The (Table-3) below shows that a total of 1436 new bank branches have been opened between March 2012 and March 2017. The majority of the branches were opened by public sector banks. The contribution of private sector banks has been reasonable. Although, there has been a gap between the total figures of public and private banks in the last six years. Area wise these banks have opened more branches in rural areas than urban pockets during the last quarter. This is a very good sign and shows the intent of the banks in reaching the underserved section of the population (Fig-1).

**Table 3: Agency wise bank branch coverage in Odisha**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Sector CBs</td>
<td>2157</td>
<td>2313</td>
<td>2637</td>
<td>2889</td>
<td>3041</td>
<td>3128</td>
</tr>
<tr>
<td>Private Sector CBs</td>
<td>216</td>
<td>269</td>
<td>350</td>
<td>457</td>
<td>514</td>
<td>569</td>
</tr>
<tr>
<td>RRBs</td>
<td>885</td>
<td>901</td>
<td>951</td>
<td>983</td>
<td>991</td>
<td>991</td>
</tr>
<tr>
<td>Co-operative</td>
<td>337</td>
<td>341</td>
<td>343</td>
<td>343</td>
<td>343</td>
<td>343</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>3595</strong></td>
<td><strong>3824</strong></td>
<td><strong>4281</strong></td>
<td><strong>4672</strong></td>
<td><strong>4889</strong></td>
<td><strong>5031</strong></td>
</tr>
</tbody>
</table>

Source: Odisha Inclusive Finance Bulliten various edition

**Fig.1: Agency-wise Bank branch Coverage**

<table>
<thead>
<tr>
<th>Particulars of Item</th>
<th>As on Mar 2012</th>
<th>As on Mar 2014</th>
<th>As on Mar 2015</th>
<th>As on Mar 2016</th>
<th>As on Mar 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Deposits</td>
<td>1295104</td>
<td>169642</td>
<td>196232</td>
<td>218748</td>
<td>253115</td>
</tr>
<tr>
<td>Total advance utilised by the state</td>
<td>9,30,948</td>
<td>144726</td>
<td>143614</td>
<td>163733</td>
<td>174539</td>
</tr>
<tr>
<td>CD Ratio (%)</td>
<td>71.88</td>
<td>85.31</td>
<td>73.19</td>
<td>74.85</td>
<td>68.96</td>
</tr>
<tr>
<td>Total Priority Sector Advances (TPSA)</td>
<td>4,13,290</td>
<td>52554</td>
<td>57876</td>
<td>73386</td>
<td>84202</td>
</tr>
<tr>
<td>% to Total Credit</td>
<td>59.57</td>
<td>55.72</td>
<td>56.76</td>
<td>63.94</td>
<td>65.26</td>
</tr>
<tr>
<td>To Agriculture (% of TSAP)</td>
<td>28.68</td>
<td>29.01</td>
<td>29.38</td>
<td>33.51</td>
<td>31.69</td>
</tr>
<tr>
<td>To SC/ST (% of TSAP)</td>
<td>10.11</td>
<td>32.74</td>
<td>33.24</td>
<td>33.16</td>
<td>27.61</td>
</tr>
</tbody>
</table>

Source: Agenda 147th, 143rd, 139th, 135th and 131st SLBC, Odisha meeting

The ratio of the total loan advances to total deposits of banks serves as an important indicator of banking activity, reflecting their development approach to lending. There has been a steady increase in the CD ratio of all banks over the years (Figure-2). The area wise position of a CD ratio of banks for three years is given below:
Table 5: Area wise CD Ratio (%) in Odisha

<table>
<thead>
<tr>
<th>Area</th>
<th>As on Mar 2014</th>
<th>As on Mar 2015</th>
<th>As on Mar 2016</th>
<th>As on Mar 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>62.24</td>
<td>63.69</td>
<td>63.43</td>
<td>66.17</td>
</tr>
<tr>
<td>Semi Urban</td>
<td>49.18</td>
<td>45.71</td>
<td>41.88</td>
<td>44.33</td>
</tr>
<tr>
<td>Urban</td>
<td>45.66</td>
<td>50.24</td>
<td>55.92</td>
<td>57.66</td>
</tr>
</tbody>
</table>

Source: Agenda 147th, 143rd, 139th, 135th and 131st SLBC Odisha

Thus, CD ratio has been steadily increasing from 62.24 in March 2014 to 66.17 as on March 2017 in rural areas whereas in urban areas, it raised from 45.66 percent to 57.66 percent (Table 5). Further credit deployment by banks in the rural areas is more in comparison to the deposits mobilized from rural areas. Funds mobilized from the semi-urban areas and urban areas are also being deployed in rural areas. As per the Agenda note of 147th SLBC, Odisha meeting, 6 districts CD ratio is more than 60 percent and 12 districts CD ratio is less than 40 percent.

SHG – BANK LINKAGE PROGRAMME

Table 6: Progress under SHG-BLP as on 31 March 2017 (Amt. in Million)

<table>
<thead>
<tr>
<th>No. of SHGs</th>
<th>Savings Amount</th>
<th>Loan disbursed Amt</th>
<th>Loan Outstanding</th>
<th>NPA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of SHGs</td>
<td>No. of SHGs</td>
<td>Amount</td>
<td>No. of SHGs</td>
</tr>
<tr>
<td>431487</td>
<td>62745.1</td>
<td>72420</td>
<td>96099.49</td>
<td>220662</td>
</tr>
</tbody>
</table>

Source: NABARD Regional Office, Bhubaneswar

JOINT LIABILITY GROUPS (JLGS)

In order to develop effective credit products for small/marginal/tenant/farmers, oral lessees, and sharecroppers, as also entrepreneurs, engaged in various non-farm activities, National Bank for Agriculture and Rural Development (NABARD) has first introduced the concept called Joint Liability Group (JLG). In the State of Odisha, as on 31st March 2017, 431487 SHGs had saving balance of Rs.62745.1 million with banks. Nearly 72,420 SHGs has been linked with banks and loan disbursed to the group stood at INR 96099.42 million till March 2017 and loan outstanding of 220662 is at the tune of INR 220662 million (Table-6). It is also pertinent to mentioned here that NPA have also reached at 14.08%. The SHG model considers as an avenue of economic empowerment of rural women extending the banking outreach in an affordable way.
Table 7: Status of JLG in Odisha compare to Eastern region and India as on March 2017 (Amount in Lakh)

<table>
<thead>
<tr>
<th>Region</th>
<th>Cumulative No of JLGs promoted as on Mar 2016</th>
<th>Cumulative loan disbursed as on Mar 2016</th>
<th>No of JLGs promoted during 2016-17</th>
<th>Loan disbursed during 2016-17</th>
<th>Cumulative No of JLGs promoted as on Mar 2017</th>
<th>Cumulative loan disbursed as on Mar 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odisha</td>
<td>177207</td>
<td>130405.52</td>
<td>83225</td>
<td>83217.89</td>
<td>260432</td>
<td>213533.41</td>
</tr>
<tr>
<td>Eastern</td>
<td>466408</td>
<td>385688.29</td>
<td>234019</td>
<td>251924</td>
<td>700427</td>
<td>637612.53</td>
</tr>
<tr>
<td>India</td>
<td>1751722</td>
<td>1733695.46</td>
<td>701623</td>
<td>951117.33</td>
<td>2453345</td>
<td>2684812.79</td>
</tr>
</tbody>
</table>

Source: Status of Microfinance in India 2016-17

PRIMARY AGRICULTURAL COOPERATIVE SOCIETIES (PACS)

Following the ‘Raiffeisen Model’, PACS came to existence after the enactment of Cooperative Credit Societies Act 1904. PACS functions on the basis of cooperative principles of voluntary participation, democratic control, limited area of operation and limited liability. These societies work at the village level and are meant for the farmers regarding provision of requisite short term and medium term loans. In addition to these PACS also helps in the formulation and implementation of agricultural development plans for the welfare of its members. The PACS are associated with following functions:

(i) they borrow adequate and timely funds from DCCBs and help the members in financial matters; (ii) they attract local savings in the form of share capital and deposits from the villagers, thereby inculcating the

habit of thrift; (iii) they supervise the end use of credit; (iv) they make available fertilizers and insecticides etc. to the needy farmers; (v) they provide machinery on hire basis to the farmers; (vi) they associate with the programmes and plans meant for the socio-economic development of the village; (vii) they are also involved in the marketing of farm produce on behalf of the farmer-borrowers; (viii) they provide storage facilities and marketing finance; and (ix) they supply certain consumer goods like rice, wheat, sugar, kerosene, cloth etc. at fair prices.

In Odisha there are three tier structure of Credit Cooperative Structure (CCS) which is similar to other states as shown below (Figure 3).

Figure 3

MFI COVERAGE IN ODISHA

The (Table 8) below gives a list of MFIs operating in the state. It captures growth rates of active borrowers, loan outstanding and outreach in terms of no of districts covered by MFIs. There is an increase in the overall portfolio outstanding of the MFIs (37.1%) in comparison to the last financial year. It is also encouraging to see that some of the MFIs including local ones are expanding their outreach in the state.

Table 8: Microfinance coverage in Odisha

<table>
<thead>
<tr>
<th>FY 15-16</th>
<th>FY 16-17</th>
</tr>
</thead>
<tbody>
<tr>
<td>MFI Count</td>
<td>No. Branches</td>
</tr>
<tr>
<td>10</td>
<td>407</td>
</tr>
</tbody>
</table>

Source: MFIN Micrometer

KISAN CREDIT CARD (KCC)
Kisan Credit Card scheme was introduced in August, 1998 to facilitate farmers easy and timely access to short term credit for purchasing farm inputs while conducting seasonal agricultural operations for raising crops. Now the scheme has been extended to cover tenant farmers, oral lessees, farmers to redeem debt from informal sources, besides providing long term as well as consumption credit. The progress of KCC as on 31st March 2017 is as under:

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Bank</th>
<th>No of KCC Issued till March 2017</th>
<th>Total amount disbursed 2017</th>
<th>Amount disbursed till March 2017</th>
<th>Balance outstanding as on March 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Public Sector Bank</td>
<td>261813</td>
<td>379745</td>
<td>2365.83</td>
<td>961281</td>
</tr>
<tr>
<td>2</td>
<td>Private Sector Bank</td>
<td>79000</td>
<td>97072</td>
<td>583.06</td>
<td>51353</td>
</tr>
<tr>
<td>3</td>
<td>Regional Rural Bank</td>
<td>187449</td>
<td>303779</td>
<td>1177.64</td>
<td>595549</td>
</tr>
<tr>
<td>4</td>
<td>Orissa State Co-operative Bank</td>
<td>86728</td>
<td>3151424</td>
<td>10203.79</td>
<td>5085823</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>614990</td>
<td>3932020</td>
<td>14330.32</td>
<td>6694006</td>
</tr>
</tbody>
</table>

Source: 147th SLBC, Odisha Agenda

There has been considerable progress in the number of cards and the amount disbursed under the KCC scheme over the years. The performance of KCC scheme varies widely across regions and financial institutions. The Eastern & NER lag behind other regions. The performances of Regional Rural Banks (12.65 percent) are comparatively lower than Co-operative banks and commercial banks in the state (Table 9). OSCB had introduced Kalinga Gold Kisan Card with considerable ads on facilities. Odisha has assumed the fourth position in the country in issue of KCC (in terms of number) only next to UP, AP and Rajasthan.

SUGGESTIONS AND RECOMMENDATION

On the basic of the study the following suggestion are made. They are as follows

i. Agriculture in Odisha has still suffers from: i) poor productivity, ii) falling water levels, iii) expensive credit, iv) a distorted market, v) many intermediaries who increase cost, but do not add much value, vi) poor infrastructure, and vii) inappropriate research. Thus the supply leading approach with more emphasis on credit in isolation from the above factors will not help agriculture to attain the desired growth levels. Furthermore, agriculture being a core subject, State and districts are required to play a more pro-active role in agriculture development by putting in place adequate infrastructure through different means (Golait, 2007).

ii. Department of agriculture needs to be strengthened to help farmers in improving the productivity and creating awareness in solving their problems rather than mere spectators/attending to paperwork, meeting. Reorganise for favourable working conditions may be required.

iii. There is also a need for exploring new innovations in product design and methods of delivery, through better use of technology and related processes. It needs to be seen whether credit going to farmers, especially small and marginal is in sufficient quantity and if so, whether it will have any meaningful effect in the absence of other supportive measures for ensuring their economic viability. In this context, creation of production and employment opportunities in the rural sector through public investment assumes critical importance (Arabi, 2011).

iv. The SHG-Bank Linkage model is an outstanding example of an innovation, leveraging on community-based structures and existing banking institutions (Arabi, 2011). In future, concerted efforts have to be made for enhancing the flow of credit in critical infrastructure areas such as irrigation, marketing and storage, etc., and also for areas such as watershed/wasteland development, wind energy, allied activities such as poultry, horticulture, dairying, etc.

v. There is an urgent need to upscale the KCC outreach to cover all the eligible farmers by creating greater education through financial literacy camp and giving greater publicity to the scheme. Updation of land records and sensitization of bank staff through training programmes will further add to the spread of the scheme. Furthermore, there is also a need for developing special agricultural credit plans for small and marginal farmers with higher component of direct finance.

vi. Grassroots NGOs should play a critical role at this juncture. They are vertically integrated with the farmers for providing them critical inputs or processing their produce, could increase the credit flow to agriculture significantly.

At last but not the least the bankers will have to play an active role in supporting farmers in several ways, just like they did during the heydays of the green revolution through Farmer approach (Khan, 2008). FARMER Approach, signifies as follows, Finance: Adequate and timely need for agriculture credit is the need of the hour. As credit is consider as important input, which can command all other ressources. Allied Activities: It is through increased income of the farm families through diversification. Allied activities act as a hedge the downsides in agriculture. Today, crops constitute less than 30 percent of farm income with the rest coming from dairy, poultry, beekeeping and horticulture. Risk Management: Risk mitigation measures like crop and weather insurance, health and crop...
insurance are very critical for maintaining the health of the rural financial system and ensuring the viability of the agricultural sector. Some of these can be bundled and provided as a package to the small farmers as Micro Insurance.

**Market Access:** Efficient marketing which would include innovative approaches, such as the producer companies, contract farming, value chain Agro processing and Agri business are particular important for the small and marginal farmers. It should also include availability of quality inputs to the farmers, such as seeds, fertilizer and pesticides.

**Extension and Research:** Research and extension linkages should comprise the all four critical pairs of the L’s Lab to Land, Land to Lab, Land to Land and Lab to Lab. It needs to be appreciated that the quality extension and research services in a cost effective manner is a sine qua non for productivity enhancement and risk mitigation. **Resources (Other than Finance):** Inputs like water, seed, fertilizer, pesticides and healthy and skilled human resources. Potable water supply and toilets are, for instance very important. Some of the banks have found that there are significant benefits for construction of toilets in the rural areas and financing them is a bankable proposition.

V. CONCLUSION

Agricultural credit has played a vital role in supporting agricultural production in the state. Green Revolution characterised by a greater use of inputs like fertilizers, seeds and other inputs, increased credit requirements which were provided by the agricultural financial institutions. Though the outreach and the amount of agricultural credit have increased over the years, several weaknesses have crept the viability and sustainability of these institutions. Furthermore, antiquated legal framework and the outdated tenancy laws have hampered the flow of credit and development of strong and efficient agricultural credit institutions.

From the present study reveals that though the overall flow of institutional credit has increased over the years, there are several gaps in the system like inadequate provision of credit to small and marginal farmers, paucity of medium and long-term lending and limited deposit mobilisation and heavy dependence on borrowed funds by major agricultural credit purveyors. These have major implications for agricultural development as also the well being of the farming community. Efforts are therefore required to address and rectify these issues.

The changes in the consumption and the dietary patterns from cereals to non-cereal products, a silent transformation is taking place in the rural areas calling for diversification in agricultural production and value addition processes in order to protect employment and incomes of the rural population. In the changed scenario, strong and viable agricultural financial institutions are needed to cater to the requirements of finance for building the necessary institutional and marketing infrastructure. Agriculture credit structure needs revamping to improve the efficiency of the credit delivery system in Odisha. Since, the access of small and marginal farmers to credit has been constrained by their inability to offer the collaterals, micro finance, which works on social collaterals, can go a long way in catering to their requirements. Hence, there is a need to promote micro finance more vigorously on a widespread basis.

To conclude, an assessment of agriculture credit situation brings out the fact that the credit delivery to the agriculture sector continues to be inadequate. It appears that the banking system is still hesitant on various grounds to purvey credit to small and marginal farmers. The situation calls for concerted efforts to augment the flow of credit to agriculture, alongside exploring new innovations in product design and methods of delivery, through better use of technology and related processes.

**REFERENCES**


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Design of Nonlinear Controller and Analysis of Nonlinear Phenomena in Non-Minimum Phase DC-DC Switched Mode Converter

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Abstract- This paper provides design and implementation details of sliding mode controller for buck-boost converter in continuous conduction mode (CCM). This paper also looks in to the nonlinear dynamics of the power converter such as chaos and bifurcation in particular. MATLAB-Simulink based simulation has been carried out to illustrate the simulation results.

Index Terms- Buck-Boost converter; sliding mode controller; chaos; bifurcation

I. INTRODUCTION

Switched mode power converter (SMPC) plays a vital role in different applications ranging from distributed generation, electric vehicle, portable electronic products and consumer electronics. SMPC is a nonlinear electronic circuit whose dynamics change with the change in the position of the switch. There are numerous topologies of SMPC and boost and buck-boost converter are some widely used converter topology. The output voltage to duty cycle transfer function of boost and buck-boost converter exhibit non-minimum phase behavior which means a zero in the right half of s-plane. There are several ways to mitigate the non-minimum phase behavior of the converter.

The main aim of switched mode power converter is to either step-down or step-up the unregulated DC voltage and provide regulated DC voltage. There are different controllers used for controlling the DC voltage of switched mode power converter. The controllers can be classified as linear controller or nonlinear controller. In linear controller, classical PID controller are good option but the PID controller fails to control the system with large signal disturbance. Therefore, nonlinear controllers are used. Sliding mode control is one of the widely used control scheme used for control of DC-DC converter as the controller is robust to change in parameters.

Mathematical model of buck-boost converter in transient state has been formulated using Laplace transform and z-transform in [1]. Buck-boost converter is a non-minimum phase system because the transfer function of buck-boost converter possess a right half plane zero (RHPZ) in transfer function. Due to such characteristics if the duty cycle of the converter crosses 0.5 in peak current mode control, harmonic oscillations are created which leads to chaos. The complete analysis of bifurcation and chaos of buck-boost converter has been reported in [2,5,12,14]. For wide range of operation of buck-boost converter, double loop control is used where current loop is considered as the inner loop and voltage loop is considered as the output loop [3]. Robust control of buck-boost converter is presented in [4]. Adaptive back-stepping control of buck-boost converter is presented in [6]. Cascaded PID control of buck-boost converter is studied in [7]. PWM based sliding mode control of DC-DC converter operating in discontinuous conduction mode (DCM) has been studied in [8]. There are different ways to control the chaotic behavior of DC-DC converter which has been presented in [10]. Period-doubling bifurcation of DC-DC converter has been reported in [11]. Current controlled Buck-Boost converter with ramp compensation operating in DCM has been studied in [13]. Discrete time map for analysis of bifurcation and chaos in DC-DC converter is reported in [15]. Maityet al., studied the bifurcation of voltage mode controlled Buck converter using exact discrete model [16].

From the above discussion it can be observed that the nonlinear analysis and nonlinear controller design has been an emerging area of research for power electronics professional. This paper attempts to provide a detailed analysis of nonlinearity of SMPC and aspects of nonlinear controller design. This paper provides design details of sliding mode controller for buck-boost converter and provides details of nonlinear dynamics of buck-boost converter.

This paper is organized as follows. Section II provides mathematical model of buck-boost converter (state-space average model and discrete-time model). Section III provides sliding mode control of buck-boost converter under CCM and DCM. Section IV provides preliminary concepts of bifurcation and chaos. Section V provides nonlinear phenomena of buck-boost converter. Section VI presents simulation results. Section VII concludes the paper.

II. MATHEMATICAL MODEL OF BUCK-BOOST CONVERTER

The circuit diagram of buck-boost converter is shown in Figure 1.

![Circuit diagram of buck-boost converter](image-url)
The voltage gain of Buck-Boost Converter is \( \frac{V_o}{V_{in}} = \frac{-d}{1-d} \)

The current ripple of Buck-Boost Converter is
\[
\Delta I_L = \frac{(1-d)^2 RT_s}{L}
\]

The voltage ripple of Buck-Boost converter is
\[
\frac{\Delta V_o}{V_o} = \frac{dT_s}{RC}
\]

The converter has two states i.e ON state and OFF state. The dynamics of converter in these states can be represented as

**ON State**

\[
\begin{align*}
\dot{x} &= A_1 x + B_1 u \\
y &= C_1 x
\end{align*}
\]

**OFF State**

\[
\begin{align*}
\dot{x} &= A_2 x + B_2 u \\
y &= C_2 x
\end{align*}
\]

Here the state variables are defined as
\[
\begin{align*}
x &= \begin{bmatrix} i_L \\ V_c \end{bmatrix} \\
u &= V_{in} \\
y &= V_o
\end{align*}
\]

The dynamics of ON state can be represented as
\[
\begin{align*}
\frac{d}{dt} \begin{bmatrix} i_L \\ V_c \end{bmatrix} &= \begin{bmatrix} -\frac{R_o}{R} + \frac{R}{C(R+R_c)} \\ -\frac{R}{L(R+R_c)} \end{bmatrix} \begin{bmatrix} i_L \\ V_c \end{bmatrix} + \begin{bmatrix} \frac{1}{L} \\ 0 \end{bmatrix} V_{in}
\end{align*}
\]

The dynamics of OFF state can be represented as

**III. CONTROLLER DESIGN FOR DC-DC BUCK-BOOST CONVERTER**

The basic control scheme for DC-DC buck-boost converter is voltage mode controller. But the voltage mode controller has different limitations such as (a) poor line and load regulation, (b) poor current control and (c) slower transient response.
Therefore, current mode control scheme is used. In current mode control scheme, the inductor current is measured and the current is compared with a reference current to derive PWM signal for the switch. Fig. 2(a) shows the current mode control (CMC) of Buck-Boost converter and Fig. 2(b) shows the waveform of CMC.

![Current Mode Control Diagram](image)

**Fig. 2.** (a) Buck-Boost converter in current mode control, (b) Output voltage and current of converter in current mode control

**Sliding Mode Controller**

Sliding mode control is a particular type of the variable structure control system (VSCS), which is characterized by a discontinuous feedback control structure that switches as the system crosses certain manifold in the state space to force the system state to reach, and subsequently to remain on a specified surface within the state space called sliding surface. The switching function (sliding variable) is a function of the states and the sliding surface represents a relationship between the state variables. The system dynamics when confined to the sliding surface is referred as an ideal sliding motion and represents the controlled system behaviour, which results in reduced order dynamics with respect to the original plant.

![Sliding Mode Controller Diagram](image)

**Fig. 3.** Fixed-frequency sliding mode control of buck-boost converter under CCM

Fig. 3 shows the fixed-frequency sliding mode control of buck-boost converter under CCM. In the sliding mode control, three state variables are considered such as (a) voltage error, (b) derivative of voltage error and (c) integration of voltage error. The state-variables for the sliding mode control can be defined as

\[
\begin{align*}
\dot{x} &= A x + B u \\
\dot{x} &= \begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & -1/r_L C & 0 \\ 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ \beta V/L C u_B \\ -\beta V/L C u_B \end{bmatrix} u
\end{align*}
\]

The switching function of generalized sliding mode control can be represented as

\[
\begin{align*}
\dot{x} &= \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & -1/r_L C & 0 \\ 1 & 0 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ \beta V/L C u_B \\ -\beta V/L C u_B \end{bmatrix} u
\end{align*}
\]

The time differentiation of above equation can be represented as

\[u = \begin{cases} 1 & S > 0 \\ 0 & S < 0 \end{cases}\]

Where \( S = \sum_{i=1}^3 \alpha_i x_i = J^T x \)

Here \( J^T = [\alpha_1 \ alpha_2 \ alpha_3] \)

To ensure existence condition, following reachability condition must be satisfied \( \lim_{S \to 0} S \dot{S} < 0 \)
\[
\frac{dS}{dt} = J^T Ax + J^T B \overline{u}_{eq}
\]

Taking \( \frac{dS}{dt} = 0 \), we get

\[
\overline{u}_{eq} = - \left[ J^T B \right]^{-1} J^T Ax
\]

Substituting the values, we get

\[
\overline{u}_{eq} = \beta L \frac{\alpha_1}{\alpha_2} \frac{1}{r_L C} i_c - \frac{\alpha_1 L C}{\alpha_2} (V_{ref} - \beta V_o)
\]

IV. BIFURCATION AND CHAOS

A sudden change in the qualitative behavior of a system is termed a bifurcation. Successive bifurcations lead to instability in power electronic converters. The type of bifurcation is classed by the qualitative change that takes place when a parameter is varied. How far a system is from instability is termed the stability margin. There are two metrics to consider; the phase margin and the gain margin.

Bifurcations that occur in power electronic converters are typically classed as standard (smooth) bifurcations or non-standard (non-smooth) bifurcations. Smooth bifurcations do not involve any structural change associated with the loss in stability. In continuous time systems, they occur when the real part of one, or more, of the eigenvalues of the system is greater than zero. In discrete-time systems, they occur when the magnitude of the eigenvalue is greater than 1.

Typically, for power electronic converters, smooth bifurcations can be classified into two categories; slow-scale bifurcations and fast-scale bifurcations which lead to slow scale instability and fast-scale instability. Typical types of bifurcations that occur in power electronic converters are Hopf bifurcations and period-doubling bifurcations. Non-smooth bifurcations do cause a structural change and are characterized by a sudden jump of the operating point. They occur due to interactions between system trajectories and state-space boundaries where the system switches from one configuration to another. Border collision bifurcations and grazing bifurcations are types exhibited by power electronic converters. Fig. 4 illustrate the classification of different bifurcation in nonlinear dynamics whereas Fig. 5 shows the different bifurcation diagram.

Fig. 4. Classification of Bifurcation

![Classification of Bifurcation Diagram](image)

Fig. 5. (a) Saddle-node bifurcation, (b) transcritical bifurcation, (c) supercritical bifurcation (d) Super-critical pitch fork bifurcation (e) Hopf bifurcation (f) Period doubling bifurcation

Chaos occurs in nonlinear systems and results in the seemingly random movement of trajectories within a bounded state-space. A chaotic trajectory is unpredictable in the long term; knowing the trajectory now does not guarantee knowing where the trajectory will end up. This contradicts the definition of a deterministic system. However, deterministic systems can exhibit chaotic behavior. The key property of chaos is the sensitivity of nonlinear systems to initial conditions. Even a small error in specifying the initial conditions to a system can result in large differences in the output as time evolves. Hence, the long term predictability of a chaotic system is unpredictable in a practical sense. Consider a logistic map \( x_{k+1} = rx_k (1 - x_k) \)

Fig. 6 shows the bifurcation diagram of above logistic map.
V. NONLINEAR PHENOMENA OF BUCK-BOOST CONVERTER

The difference equation of the converter can be represented by
\[ x_{n+1} = f(x_n, \alpha), x \in \mathbb{R}^N, \alpha \in \mathbb{R} \]
Where \( x = [i_L, V_c]^T \)

When \( S \) is closed, \[ \begin{align*}
L \frac{di_L}{dt} &= V_{in} & S = \text{closed} \\
C \frac{dv_c}{dt} &= -\frac{v_c}{R} & S = \text{closed}
\end{align*} \]

The solution of the above equation is
\[ t_n = \frac{L(I_{ref} - i_n)}{V_{in}} \]

The capacitor voltage at the said time can be represented as
\[ V_c(t_n) = V_n \exp \left( -\frac{t_n}{RC} \right) \]

When \( S \) is open, \[ \begin{align*}
L \frac{di_L}{dt} + v_c &= V_{in} & S = \text{open} \\
C \frac{dv_c}{dt} + \frac{v_c}{R} &= i_L & S = \text{open}
\end{align*} \]

The second order differential equation can be obtained as
\[ \frac{d^2}{dt^2}(i_L) + \left( \frac{1}{RC} \right) \frac{d}{dt}(i_L) + \left( \frac{1}{LC} \right)(i_L) = \frac{V_{in}}{LCR} \]

The solution for the homogeneous equation can be represented as
\[ i_L(t) = \exp \left( -\frac{t}{2\tau_{RC}} \right) \left( a_1 \sin \omega t + a_2 \cos \omega t \right) + \frac{V_{in}}{R} \]

VI. SIMULATION RESULTS

This section provides simulation results of the said controller and the converter. MATLAB-Simulink has been used to carry out the necessary simulations.

### TABLE I. SYSTEM PARAMETERS

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Symbol</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage</td>
<td>( V_{in} )</td>
<td>12V</td>
</tr>
<tr>
<td>Capacitance</td>
<td>( C )</td>
<td>700( \mu )F</td>
</tr>
<tr>
<td>Capacitor ESR</td>
<td>( R_c )</td>
<td>0.01( \Omega )</td>
</tr>
<tr>
<td>Inductance</td>
<td>( L )</td>
<td>100( \mu )H</td>
</tr>
<tr>
<td>Inductor Resistance</td>
<td>( R_L )</td>
<td>0.12( \Omega )</td>
</tr>
<tr>
<td>Switching Frequency</td>
<td>( f_{sw} )</td>
<td>200kHz</td>
</tr>
<tr>
<td>Load</td>
<td>( R )</td>
<td>2.25( \Omega ) to 5( \Omega )</td>
</tr>
<tr>
<td>Desired Output Voltage</td>
<td>( V_{ref} )</td>
<td>24V (Boost), 5V (Buck)</td>
</tr>
</tbody>
</table>

Figure 7(a) and Figure 7(b) shows the voltage and current of buck-boost converter operating in CCM in boost mode and controlled using fixed-frequency sliding mode controller. Figure 8(a) and Figure 8(b) shows the voltage and current of buck-boost converter operating in CCM in buck mode and controlled using fixed-frequency sliding mode controller. The line regulation and the load regulation property of the sliding mode controller is shown in Table II and Table III.
In nonlinear analysis, the effect of change of inductor current and the effect of change of input voltage has been shown in Figure 8 and Figure 9 respectively. The period doubling bifurcation behavior can be seen due to the change in inductor current and input voltage.

<table>
<thead>
<tr>
<th>TABLE II. LINE REGULATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPUT VOLTAGE</td>
</tr>
<tr>
<td>$V_{in} = 20V$</td>
</tr>
<tr>
<td>$V_{in} = 26V$</td>
</tr>
<tr>
<td>$V_{in} = 28V$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE III. LOAD REGULATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOAD</td>
</tr>
<tr>
<td>Minimum load</td>
</tr>
<tr>
<td>Half load</td>
</tr>
<tr>
<td>Full load</td>
</tr>
</tbody>
</table>

VII. CONCLUSIONS

This paper provides sliding mode controller design for buck-boost converter. The sliding mode converter is used because it is faster than conventional PI type controller and easier to design and implement. As converter is a nonlinear entity, sliding mode controller is one of the best suitable choice for its control. Nonlinear dynamics such as chaos and bifurcation in switched mode power converter has also been analyzed in this paper.

REFERENCES


Issues and Challenges of Urban Flood Hazard Management in North Colombo Region
(A case study of 2016 Flood Affected Kolonnawa Urban Council)

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Abstract

Floods are one of the meteorological events that often record as severe catastrophic natural hazards in the world. Flooding ranks as the most damaging forms of natural disaster in Sri Lanka. Since the majority of the populated urban spaces are being subjected to the flood hazard, urban flood hazard management has come to the fore in the field of disaster management. Many urban areas of the Western Province in Sri Lanka, especially North Colombo Region were severely affected due to the flood hazard in May 2016. Therefore, the main objective of the study is to identify the issues and challenges of urban flood hazard management processes and introduce the appropriate framework for enhancing the existing flood hazard roadmap. The methodology of the research focuses on selecting one Urban Council in the region: Kolonnawa. In the methodology, among the 13 GN divisions in the Kolonnawa Urban Council (KUC), two GN divisions were selected by using judgement sampling method for the convenience of the study and 10% of the affected households due to 2016 flood in the selected two GN divisions were selected using snowball sampling technique for primary data collection. Collected likert scale type of data according to the conceptual framework were analysed by using one sample t-test and proved that there are more than 60% of negative impact of selected variables on issues and challenges of urban flood hazard management. The research findings show that evacuation and emergency response mechanism in relation to 2016 flood hazard was only successful in short run. Several issues and challenges are still evident in terms of finding long-term solutions. Several constrains related to the existing regulations, institutional cooperation, availability of resources, involvement of the government and the attitude of the people are evident particularly in the phases of preparedness, rehabilitation and mitigation. Therefore this paper has recommended implementing long-sighted policies for overcoming such issues and challenges.

Keywords: Urban Flood Hazard, Disaster Management, Issues and Challenges, Sri Lanka

1. INTRODUCTION

A disaster is a sudden calamitous event producing great material damage, loss and distress. The definition of Asian Development Bank (2008) highlights two main types of disasters; Natural and Anthropogenic.
Due to the high modification of hydrological process in the urban areas, river basins have become more vulnerable to floods. Much of the urban space is impermeable such as paved roads, concrete yards etc. thus the infiltration is reduced and runoff volume is rapid. So only high rainfall or some time both of overflowing of rivers and rainfall can lead to floods in urban areas. As causes for urban flooding heavy rainfall, flash flooding, lack of lakes, silting, and population pressure, trespassing on water storm drains, urbanization, poor water and sewerage management has been identified and explained in the publication of National Institute of Disaster Management in India (NIDM) called ‘urban flooding and its management’.

The flood hazard management in urban areas is critical. Since several such as high concentration of commercial, industrial, recreational, government and residential activities and high density of population. Hence a proper management for urban floods must be needed. For this matter whatever the type of flood, basic flood management principles and concepts under the disaster management should be taken into consideration.

According to Carter (2008) disaster management is a cyclical process for any hazard. Here as this is mainly focused on flood management, this cyclical process should be looked in the lenses of flood hazard management. So following basic steps should be considered in flood hazard management with parallel to the disaster management cycle;

Mitigate the flood hazard preparedness to flood hazard, response to flood hazard and recovery from flood hazard.

Although these steps are implemented by lot of countries to manage the urban flood hazard, there are many issues and challenges can be seen around the world especially in urban flood hazard management. Many of the contemporary researches have focused the issues and challenges of urban flood hazard management.

Sri Lanka has been experiencing from this long time wide array of natural hazards such as tsunami, droughts, landslides, floods, storms etc. Among those hazards, flood is the most frequently occurring natural hazard in Sri Lanka. Riverine floods are the key type of flood hazard in Sri Lanka. This riverine floods and other causes related to the urbanization, Sri Lanka is now facing severe urban flood hazards consecutively.

In May 2016 Sri Lanka was hit by severe tropical storm called “Ronu” and as a result high intensity of rainfall occurred almost all the part of Sri Lanka. Specially more than 200mm rainfall occurred in Vavunia, Colombo, Gampaha, Kegalle districts. Many of the river basins such as Maha oya, Daduru oya, Kelani River, Kalu River, Gin River flooded. The upper and lower catchment of Kelani River got high intensity of rainfall at same time many of the area of the lower catchment of Kelani River were affected. Especially in Colombo and Gampaha districts urban areas such as Kaduwela, Kolonnawa, Meethotamulla, and Hanwella were flooded. As a result of this flood situation, 237,240 people displaced from their places of origin and have moved to 369 temporary safe locations. It is reported that at least 503 houses reported have been destroyed with more than 3,793 partially damaged.

2. STATEMENT OF THE RESEARCH PROBLEM

The seasonal flood hazards in Sri Lanka has become a most affected calamitous event in terms of impact population, sequence and time which caused to emerge severe economic and social problems inside in Sri Lanka. A huge flash flood occurred in May 2016 in western and Southern part of Sri Lanka especially in the region of lower catchment of Kelani River. One of the most affected region of this flood hazard was North part of the capital city of the country; Colombo. Among those affected urban areas in north Colombo region, Kolonnawa Urban Council (KUC) is significant due to many reasons. Among 13 Grama Niladhari Divisions (GND’s) of Kolonnawa urban council (KUC), 43591 people belongs to 9111 families has been affected due to this flood according to the statistics of Kolonnawa Divisional Secretariat Division (DSD). Most part of the Kolonnawa urban council (KUC) are located in the flood plain of Kelani River. As kolonnawa urban area located in flood plain of the Kelani River, many times floods has been occurred. As an urban council many of the development activities have taken place in Kolonnawa area. Illegal settlements have been constructed very closer to the flood plain areas which is protected from a bund created by Irrigation department. Many parts of this Floodplain has

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been disturbed and filled residents for different purposes. Hence, the urban flood hazards are significant in this urban clusters and flood hazard management activities are not seemed to be properly maintain in the region. Due to one of the flood affected garbage dumping zone called Meethotamulla in Kolonnawa urban council (KUC), health issues can also be identified as emerging issues. Several issues and challenges in the process of urban flood hazard management in KUC is evident. Following research questions can be identified in this area related to the urban flood hazard management.

- What are the strengths and weaknesses of urban flood hazard management process in Kolonnawa Urban Council (KUC).
- What are the urban flood hazard management issues in this area?
- What are the challenges faced by the relevant parties in the process of urban flood hazard management?
- What would be the action to be taken to minimize the issues?

Based on this research questions, the research was conducted with 3 objectives;

a) To review the strengths and weaknesses of urban flood hazard management process in KUC.

b) To identify the issues and challenges of urban flood hazard management in KUC.

c) To identify solutions to overcome the issues and challenges of the urban flood hazard management process in KUC.

3. LITERATURE REVIEW

In 1978 Dennis J Parker has done a research on the topic of “Floods in Cities: Increasing Exposure and Rising Impact Potential”. In his research, Parker has attempted to explain the links between urban growth and flood impacts. Further it discussed the problems and possibilities of reducing urban flood hazards. Bianca Stalenberg and Han Vrijling (1978) has done a research on the theme of “The Battle of Tokyo and Dhaka against Floods”. In this research, researchers attempted to identify the present condition of flood management in Dhaka and Tokyo cities. Taking as one of the poorest and one of the richest cities in the world, they have evaluate the similarities and varieties of the urban flood management structures in those two cities. And also they have introduced some suggestions to enhance the urban flood management in deltaic countries as well. In 1993 Francis O, Odemerho one of the professors in the Department of Geography of University of southern Illinois has done a research and published in the GeoJournal, volume 29 under the topic of on “Flood control Failures in a Third world City: Benin City, Nigeria – some environmental factors and policy issues”. By studying this publication it can be identified that how geographers have attempted to study the urban flood hazard management issues. As problems to the flood management in Benin City, Francis has identified land use and physical development control problems, gaps in basic hydrologic data, design and implementation problems, cultural factors and policy issues as well. As recent studies, in 2002 Hans Reinhard Verworn has done a research on the title of “Advances in Urban-drainage management and flood protection”. He has explained how urban drainage become as an integrated approach in flood protection. And also in 2010 Hanong Vinh Hung has done a study on “Flood risk management for the riverside urban areas of Hanoi; The need for synergy in urban development and risk management policies”. In this research, it has been investigated the reasons for an unusual over development of Flood prone areas outside the river dyke in Hanoi City while analyzing the urban development and disaster management policies, and suggested policy measures for regulating the rapid urbanization incorporating catastrophic flood risk planning. In most recently 2015, Chen Kun Chung has done a research on the topic of “Applying the 3 layer approaches to urban flood management”. This is one of the best studies on urban flood management because by giving some theoretical approaches to the study it has been explained the urban flood hazard management procedures. And also by analyzing a case study, it has been identified urban issues due to the floods and suggested better solutions. Likewise many of the researchers have attempted to study
the urban flood hazard management and issues of that process.

According to the project on “SLUMDMP, (1999), Disaster mitigation Action plan for Rathnapura Demonstration Project, Sri Lanka urban Multi-Hazard Disaster Mitigation Project April” it has been explained the urban flood hazard controlling strategies in Rathnapura urban area. But in the context of urban flood hazard management and related issues and challenges in Sri Lanka, lack of the available literature is significant. By understanding that lacuna of the literature this study attempts to fill the gap of knowledge in this field.

4. METHODOLOGY
4.1 Conceptual framework

The Issues and challenges of urban flood hazard management is the dependent variable (Y) of the study while several factors assumed to be affected in positive and negative mean on urban flood hazard management were identified as independent variables (Xi-Xn) as shown in the Figure 01;

Figure 01: Dependent and independent variables

As figure 01 shows, five variables were assumed in identifying the issues and challenges of urban flood hazard management. In understanding and explaining the ways of measuring above mentioned independent variables, firstly as one of the variables, rules and regulations which was leading to issues and challenges of urban flood hazard management was identified. When it comes to understand urban flood hazard management in Sri Lanka, there is no exact policy for urban flood hazard management. Due to outdated and updated rules and regulations relating to hazard management might be leading to some issues and challenges of the process of urban flood hazard management. By reviewing the applicability of related acts, rules and regulations to the urban flood hazard management process in practical scenario, it was identified the impact of rules and regulation on issues and challenges of urban flood hazard management.

As another possible variable, institutional co-operation could also be identified in this process. These variables tested with collected data from formal discussion with the relevant institutions and also with the opinion of the affected people.

Availability of resource and involvement of the government were also possible variables here. By discussing with relevant authorities and the people it was recognized.

Attitude of the people also one of the possible leading variables in the urban flood hazard management process. Attitude of the people towards local disaster management

4.2 Hypotheses

H0 – “There is no impact of selected variables such as rules and regulations, institutional co-operation, availability of resources, involvement of the government and attitude of the people on issues and challenges of urban flood hazard management”

H1 – “There is an impact of selected variables such as rules and regulations, institutional co-operation, availability of resources, involvement of the government and attitude of the people on issues and challenges of urban flood hazard management”

4.3 Sampling

The total population of this study represent the most flood affected urban center in Colombo district, Kolonnawa.
Figure 02 shows the location of research site including selected sample GN divisions.

**Figure 02: Research site and sample GN divisions**

Source – Created by using 1:50000 digital data (survey Department of Sri Lanka)

For this research two mostly flooded GN divisions were selected by using judgment sampling. Approximately 5% of the affected population due to 2016 flood of selected GN divisions were selected by using snowball sampling method as shown in the figure 03;

**Figure 03: Purposely selected GN divisions, number of affected families due to 2016 flood and sample sizes.**

<table>
<thead>
<tr>
<th>GN divisions</th>
<th>Number of affected families</th>
<th>Expected percentage</th>
<th>Sample size (Number of families)</th>
</tr>
</thead>
<tbody>
<tr>
<td>512 B, Singhapura</td>
<td>796</td>
<td>5%</td>
<td>40</td>
</tr>
<tr>
<td>511 Wellampitiya</td>
<td>204</td>
<td>5%</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1000</strong></td>
<td><strong>5%</strong></td>
<td><strong>50</strong></td>
</tr>
</tbody>
</table>

4.4 Data collection and analysis

Data were gathered by using primary and secondary data collecting methods as follows;
Primary sources – Questionnaire, Observations, Formal and informal discussions.
Secondary sources – books, journals, institutional reports, web sources.

As this study mainly based on qualitative methodology, when analyzing data, basically descriptive statistical methods such as measure of central tendency and measure of dispersion were used. To quantify the qualitative data, likert scale is used to build indexes as follows:

- Highly disagree      1
- Disagree                 2
- Neutral                   3
- Agree                     4
- Highly agree          5

Through that quantified data percentages of the responses were calculated then descriptively analyzed the impact of variables. Then to test the impact of the independent variables on the dependent variable, one sample T-test was used.

Qualitative recorded through informal and formal discussions were analyzed descriptively in confirming the quantitative analysis.

5. RESULTS AND DISCUSSION

5.1 Strengths and weaknesses of Urban flood hazard management in Kolonnawa Urban council (KUC).

The strengths of existing flood hazard mechanism in KUC are seemed to be somewhat different. Some of key points are;

- Well established operational cabin while the hazard.
- Integration of relevant institutions to operational cabin.
- Proper evacuation mechanism.
- Co-operation of people while providing basic needs for the affected people with the unity.
- Property damage estimation mechanism is in good level.

Weaknesses in the process of urban flood hazard management in KUC can be summarized as follows;

- Flood preparedness measures are not adequately maintained.
- Flood early warning system is not functioned properly.
- Officers are not enough for pre-disaster management activities.
- Slow functioning of rehabilitation measures.
- Mitigation measures are not enough adequately.

5.2 Issues and Challenges of Urban flood hazard management in Kolonnawa Urban council (KUC).

In understanding the issues and challenges of urban flood hazard management in KUC area, significance as well as the impact of the following five variables were tested.

- Rules and regulations
- Institutional cooperation
- Availability of resources
- Involvement of the government
- Attitude of the people

As mentioned in the methodology part of the study, to identify whether there is an impact of selected variables statistically on the issues and challenges of urban flood hazard management in KUC, one sample T-test is used. Before perform the t-test, indexes are built in using likert type positive questions used in the questionnaire related to five variables.

Before building the combined indexes, it was tested the reliability and the validity of the collected likert type data. Accordingly the summery of the reliability and the validity of collected likert type data is shown in following figure 04;

**Figure 04:** Measurement summery of the reliability and the validity test of collected data.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Cronbach's Alpha</th>
<th>KMO and Bartlett's Test</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive likert statements</td>
<td>.949</td>
<td>.709</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Source: Field survey data (2017)
According to the above table, in testing the reliability of the data, Cronbach's Alpha value should be higher than 0.7, in testing the validity of the data KMO and Bartlett's test value should be higher than 0.5 and p value should be lower than 0.05. It is clear that all these conditions are fulfilled in the collected data set. So the reliability and the validity of the data set is ensured.

In analyzing data to identify the issues and challenges of urban flood hazard management, the mean, median and the skewness of the built indexes is explained. (figure 05)

**Figure 05: Measurement summery of indexes.**

Source: Field survey data (2017)

As the result shows, the mean impact of the variables is 12.331 and the median impact is 10.374. Skewness is reported as 4.115 confirming positively skewed distribution of data.

As one of the variable testing method in statistics, one sample t-test is significantly applied in many situations. It is compulsory to fulfill the population distribution assumptions in order to test the variables in statistics. Therefore few assumptions to be fulfilled in this test. Accordingly, the data should be in ordinal scale and also in normal distribution. Significance level of the means is tested in this test. Accordingly in order to test the negative impact of selected variables on issues and challenges of urban flood hazard management in KUC, t-test is performed with two hypothesis as shown below.

\[ H_0: \text{The negative impact of selected variables on issues and challenges of urban flood hazard management is equal or lower than 60\%.} \]

\[ H_1: \text{The negative impact of selected variables on issues and challenges of urban flood hazard management is higher than 60\%.} \]

Source: Field survey data (2017)

The negative effect of selected variables on issues and challenges on urban flood hazard management is 12.331 and standard deviation is 19.01. Accordingly, the calculated t value is -17.725. Compare to the 0.05 significant level, calculated p value is lower than the significant level. So statistically null hypothesis (H0) is rejected and alternative hypothesis (H1) is accepted. It means that there are more than 60% negative effect of selected variables on issues and challenges of urban flood hazard management in KUC.

Hence, the impact of selected variables on issues and challenges of urban flood hazard management can be accepted.

Not only quantitatively but also qualitatively the impact of selected variables on issues and challenges of urban flood hazard management was proved. By calculating the percentages of the negative responds for the positive likert type statements given by the respondents related with five variables, negative respond percentage for each statement of the every variables were identified. Finally as a summery among all responds to the positive statements related with selected variables, more than 50% of negative responds were able to be identified considering the each sets of statements relating to each variables. So that can also be used as an indicator to identify the negative effect of selected variables on issues and challenges of urban flood hazard management in KUC.
Under the variable of rules and regulations, the inadequacy and the less flexibility of the existing rules and regulations which mainly impact on forced evacuation process while the hazard, regulation related to mitigation mechanism such as permanent removal of illegal settlements in flood prone areas and also clash of the rules and regulation with the authority of different institutions in the disaster management process were mainly identified. Even though there were good institutional contribution and co-operation in different institutions while the hazard, the rest of the phases of the hazard management process, inadequate contribution and co-operation was identified. Although the three forces of a Sri Lanka involved in the hazard management phases in KUC, the Lack of material and human resources mainly in the evacuation phase and also in the rehabilitation phase were identified in terms of evacuation people by boats and helicopters, providing temporary shelters and basic needs and also providing long term solutions for resettlement. Involvement of the government through government bodies were evident in all the phases but the inadequacy of the involvement and also creeping actions of providing long term solutions such as compensations, resettlement were identified. Under the variable of attitude of the people, the less awareness of the people and also less preference of the people in preparing to the hazard in preparedness phase, less awareness of the people about existing rules and regulation in constructing illegal settlement in lowland areas of the river banks and also the low level of attitude of less educated people about the standard procedures in providing temporary and long term solutions in each stages of flood hazard management were identified.

6. CONCLUSION AND RECOMMENDATION

Even though there were some weaknesses of urban flood hazard management process in KUC, there were some strengths such as Well-established operational cabin while the hazard, integration of relevant institutions, proper evacuation mechanism, and co-operation of people while providing basic needs for the affected people with the unity and satisfaction level of property damage estimation mechanism etc. The impact of the each variables were proved by calculating the negative responses percentages as well as the negative impact of all variables proved by using one sample t- test. Rather than the issues and challenges related with the selected independent variables, following issues and challenges were also identified in the process of urban flood hazard management in KUC too.

• Officers are not enough in different stages in flood hazard management process.
• Problems in hazard subsidies providing regulations.
• Lack of adequate temporary relocation places for evacuated people.
• Hardness of providing facilities in temporary locating places according to the racial differentiation.
• No fulfilment of the vacancies of the officers.
• Unethical activities of certain gang of people.
• High political interference and bureaucracy.

It can be concluded that there are both hidden and visible issues and challenges in urban flood hazard management process which should be highly considered in preparing an effective Disaster management mechanisms. Following suggestions can be proposed according to the selected variables;

• Rules and regulations
  ➢ Flexibility and the power of the existing rules and regulations should be enhanced and the outdated and creeping regulations should be updated. (Mitigation rules related to evacuation of the people from illegal and vulnerable areas should be formalized)

• Institutional cooperation
  ➢ Institutional cooperation should be enhanced in each stages of hazard management by decreasing the gap of cooperating while hazardous situations.

• Availability of resources
  ➢ Both physical and human resources should equally be focused to the
requirements. (vacancies of the officers should be filled, financial allocation should be increased and local authorities should be strengthen)

- **Involvement of the government**
  - Even though the local authorities responsible for many regional activities, those activities related to the hazard management should be under the supervision of the central government. (involvement of the government in each stages of hazard management should be ensured)

- **Attitude of the people**
  - To enhance the way of people thinking about the hazardous situation and related activities, public relation bureau in GN division wise should be established.

Apart from the above recommendations in order to overcome the issues and challenges, following recommendations can also be highlighted.

- Preparedness measures and an early warning system should be established.
- Pre-defined temporary location places for evacuated people should be identified.
- Compensation payment mechanism should be accelerated.
- Mitigation measures should be well focused and sustainable.
- Contribution of urban council should directly be focused on each phases of flood hazard management.
- Expertise knowledge should be used to mitigate the flood hazard.

It is finally mentioned that, unless there are well established disaster management plan and policy this may be an elusive target.

7. REFERENCES


**Web sources**


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The Effect of Age on Daily Gain, Carcass and Meat Percentage of Male Bali Cattle Fed with Complete Feed Based on Corn Silage

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Abstract- Research on the age of cattle is very important because it will determine the balance between feeding, weight gain, feed efficiency and time of finishing cattle. The purpose of this research was to investigate the effect of age on daily gain, dry matter feed intake, carcass and meat percentage of Bali cattle fed with complete feed based on corn silage. Crude protein and metabolizable energy contents of diets were 11%, and 1879.4 kcalories/kg ration, respectively. The experiment used 18 heads of male Bali cattle, with three treatments and six replications. The treatments were age of the cattle: 1.5-2 years, 2.0-2.5 years and 2.5-3 years. The cattle were housed in individual cage for three months. The results show that age of cattle had a significant effect (p<0.05) on daily gain. Average daily gain 1-1.5 years was 0.340 ± 0.041 kg/head/d, 2-2.5 years was 0.363 ± 0.032 kg/head/d and 2.5-3 years that reach 0.469 ± 0.041 kg/head/d. With the increase of age, the average weight gain and feed intake also increased. The highest carcass and meat percentage was found in cattle of 2 – 2.5 years, followed by cattle of 2.5 – 3 and 1.5 – 2.0 years. The conclusion is with respect to rate of gain and feed intake, age 2.5 – 3.0 years old was the best, where-as with respect to carcass and meat percentage, age 2.0 – 2.5 years was the best.

Keywords: age, complete feed, cattle, daily gain, carcass, meat

I. INTRODUCTION

Indonesia as an agricultural country is rich in plant and animal resources. Bali cattle is a local livestock resource that has a strategic role to stabilize food security, providing power for many purposes and increasing income of the farmers. Total of Bali cattle in Indonesia in 2007 was 3.5 million heads or one-third of the total of cattle in Indonesia (Ditjennak, 2008).

In recent years, due to the decrease of grazing area for livestock, many more farmers in Indonesia have changed the raising livestock system from grazing to zero grazing (cut and carry system). The application of zero grazing system is also enhanced by the low land holding of the farmers and multiple cropping practices in which the farmers are not only raising livestock, but also growing many crops. In the zero grazing system, all nutrients needed by animals are provided by the farmers. For this purpose, the farmers collected many feed ingredients to formulate diets adjusted to the needs of specific animals and ensiling them as complete feed. The use of complete feed is more practical because it can improve of feed delivery, provide balanced nutrition for livestock, can increase the value of agricultural waste, and prevent of livestock from the use of less palatable feed ingredients.

Cattle reared in zero grazing generally come from different ages and are directed to produce meat. Sometimes they are grouped based on age and sometimes they are mixed. There is limited information concerning the effect
of age of Bali cattle fed with complete feed based diets on their growth performance and meat characteristics. Through feeding of high quality complete feed silage, growth rate of cattle will be higher and slaughtering weight of cattle can be achieved more quickly so that the quality and quantity of higher carcass. The use of corn waste (corn hay) from agriculture can be improved in utilization by fermentation technology. Fermented corn hay quality is better and the raw material for a wide range of complete feed with a mix of local ingredients from the agricultural industry such as rice bran, molasses, pollar, corn, coconut cake, kapok seeds, cattlemix and urea.

The advantages of the complete feed are: improve efficiency in the delivery of forage with lower palatability after mixed with the concentrate can increase consumption, limit the consumption of concentrate, easy and convenient mixing forages and concentrates, livestock are easily sated and reduce dust (Surjadi, 2006). Carcass of cattle is a body part cutting results after reducing the blood, head, four legs on the bottom (ranging from carpus and tarsus), skin, gastrointestinal tract, bowel, urine, heart, throat, lungs, spleen, liver and tissues fat attached to the body, where-as the kidney is often included as carcass. The main factors to consider to assess the marketed carcass are: carcass weight, carcass pieces which can be sold (cutability) and the quality of the meat (Soeparno 1992).

Genetic and environmental factors affecting the body composition are weight distribution and chemical composition of carcass components. Environmental factors are divided into two categories namely, physiology and nutrition. Age, body weight and growth rate levels may also affect the composition of the carcass (Suryadi, 2006). The main components of the expected carcass maximum meat are optimal proportions of fat and minimal bone proportion. In general, the result of the carcass assessment was done by the percentage of carcass. The higher the percentage, the better the performance of carcass. There are two kinds of carcass weight: fresh carcass weight or carcass weight before withered and shriveled carcass weight (cold carcass weight) that is carcass weight after withered for approximately 24 hours. The percentage of carcass is affected by carcass weight, weight of livestock, conditions, breed, proportion of non carcass parts, rations provided and slaughtering method (Berg and Butterfield, 1978).

Carcass weight is one important parameter in the evaluation of carcass system. As an indicator, the carcass is not a good predictor of carcass productivity because of variations in the type of breed, nutrition and type of tissue growth causing the decrease level of accuracy. To minimize the resources of the weight of carcass diversity, it needs to be combined with other variables such as subcutaneous fat thick tendon and rib eye area (loin eye area) in predicting weight components of carcass and meat production (Priyanto et al., 1993).

Some factors that affect the production of an animal carcass are breed, sex, age and slaughter weight in addition to nutritional factors (Berg and Butterfield, 1978). Soeparno (1992) states that the increase slaughter weight carcass will yield the increase carcass as well. so that the meat section becomes larger. The higher the weight cut led to a fresh carcass weight and the percentage is also higher. In relation to age, increasing age of the cattle is in line with the live weight gain and will increase carcass weight.

Meatiness is part of the carcass after the bones and most of the fat (subcutaneous fat and intramuscular fat) are removed. The higher the body weight of an animal, then the percentage of weight. The higher the body weight of an animal, the higher the percentage of carcass weight. Meatiness (meat containing some parts of intramuscular fat and subcutaneous fat that can be accepted by consumers) are influenced by several factors: breed, body weight, age, degree of obesity, carcass weight, and sex hormones (Awaluddin, 2006).
Research on the age of livestock is very important because it is associated with daily gain and the weight of maturity of ideal cut weight, feed efficiency and age of finishing cattle. Likewise the age of cattle is closely related to the carcass percentage, carcass weight and meat produced by fattening. This study aims to determine the effect of age of male Bali cattle fed with complete feed based on corn silage on daily gain, feed consumption, and percentage of carcass and meat of male Bali cattle.

II. MATERIALS AND METHODS

The study was conducted in Takalar, 80 kilometers from the city of Makassar, South Sulawesi. The study used 18 male Bali cattle with ages range from 1.5 to 3 years. The study design was randomized block design with three range of age as treatments and six replications. There are three treatments namely: A. age 1.5 - 2.0 years, B. age 2.0 - 2.5 years, and C. age 2.5 - 3.0 years. Complete feed awarded consists of corn bran, rice bran, coconut cake, kapok seeds, molasses, minerals and NaCl cattle and agricultural waste (corn silage). Complete feed protein content of 11% and energy metabolism 1879.40 kcal / kg feed. Livestock under study were kept in individual cage equipped with places for food and drink. Given feed consists of complete feed based on corn silage ad libitum given three times a day. Likewise, drinking water was available at all times during the study. Every day weighing the food provided was done to determine the feed intake and to determine the growth, the weighing was done twice a month.

The variables observed:

1. Daily feed consumption is the amount of food given less the amount of residual feed.
2. Body weight is obtained from the cattle weighing by using a 1000 kg cattle scale. Formulatodetermine the weight gain/cattle/day. Daily gain (kg / head / day) is final weight minus initial weight divided by period of time (days) multiplied by 100%.
3. Carcass percentage was obtained from carcass weight divided by live weight multiplied by 100%.
4. Meat percentage was obtained from meat weight divided by carcass weight multiplied by 100%

III. RESULTS AND DISCUSSION

Effect of complete feed against daily weight gain on male Bali cattle.

Various responses of experts about the degradation of Bali cattle weight breeding were caused by inbreeding or negative selection. But on the other hand, they also said the difficulty of finding large size of male Bali cattle (bull) today was due to early selling age and low feed quality. Bali cattle are very responsive to improvement of feed. The average daily weight gain and standard deviation of male Bali cattle fed with complete feed based during the study is presented in Table 1.

<table>
<thead>
<tr>
<th>Treatment of Age</th>
<th>Mean daily gain and s.d</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (1.5-2 years)</td>
<td>0.340±0.044</td>
</tr>
<tr>
<td>B (2-2.5 years)</td>
<td>0.363±0.032</td>
</tr>
<tr>
<td>C (2.5-3 years)</td>
<td>0.469±0.041</td>
</tr>
<tr>
<td>Mean and s.d.</td>
<td>0.391 ± 0.069</td>
</tr>
</tbody>
</table>

Description: different superscripts in the same column show significant differences between treatments (p<0.05).
The analysis of variance shows that age has a significant effect (p<0.05) on daily weight gain of male Bali cattle fed with complete feed. Bali cattle weight gain increased with the increase age of the cattle in which the older age 2.5 - 3.0 years weight gain was higher than 2.0 - 2.5 years and higher than the age 1 - 1.5 years. This shows that the older livestock, was able to respond more feed than the younger cattle. Arianto (2006) stated that the current high growth of Bali cattle is 2.5-3.0 years of age due to maximum bone condition but the growth of muscle mass. On the contrary, some livestock still need food for the growth of muscle mass, bones, and other vital organs. Daily gain of Bali cattle in this research result was about 0.340 - 0.469 kg/head/day higher than the result of Handiwirawan and Tiesnamurti (2017) research which was 0.33 kg/head/day; Kadarsih (2004) reported 0.22-0.33 kg/head/day. The differences can be achieved through the provision of good quality feed. According to Suhadi (1991), the provision of quality feed had an effect on weight gain. Another study using corn silage get a higher weight gain is 0.62 kg / head / day (Widiyazid, et al, 1999) and 0.96 kg / head / day (Hamdan et al, 2004). Daily gain of PO cattle (Onggole cross) is 0.73-0.83 kg/head/day (Nusi, et al., 2001). This difference may be due to the quality of corn silage and research environment that is in Central Java tends to be cooler than in South Sulawesi. Male Bali cattle weight gain is lower than the Madura cattle, but Bali cattle can grow up to the age of 4 years depending on environmental factors. Figure 1 shows a growth pattern / weight changes in each weighing during the study period.

![Figure 1. Changes in Body Weight of Male Bali Cattle](image)

Figure 1 shows that weight gain of male Bali cattle at the age of more than 2.5 - 3.0 years is much higher than the age group of under two years. This shows that the age of three years is the peak age for the growth to reach ideal slaughter weight (finishing) and the Bali cattle aged three years to do short-term fattening for 3 months.

The Effect of Complete Feeding on Average Consumption of Male Bali Cattle

Results of complete consumption of male Bali cattle in different ages during the study is shown in Table 2.

Table 2. Average Feed Consumption of Male Bali Cattle in each period.
Treatment                  Periods (2 week)
Age1            2         3           4             5    Averages
A10.1         12.4             12.2         11.8           14.7     12.40a
B       15.7          15.9             16.4   17.0            17.6 16.56b
C       19.2          19.3           19.4            18.5           20.5           19.40c

Description: different superscripts in the same column show significant differences between treatments (p<0.05). Treatment A: age 1.5-2 years, B: 2-2.5 years and C: 2.5-3 years.

Analysis of variance (Appendix 3) shows that the age group has a significant effect (P<0.05) on the average feed consumption. Feed consumption increases with the increase of age. Treatment 2.5-3 years was significantly different (P<0.05) from age 2-2.5 years and 1.5-2 years. This is due to the increase of age feed consumption. This is in line with Depison and Sumarsono (2001) who state that the higher the weight the higher the consumption.

Feed requirements of older and heavier cattle are more though the percentage of the initial weight ratio is not much different. This indicates that the level of quality and palatability of complete feed can meet basic living needs and the production of muscle mass, bone and fat. Livestock consumption is influenced by age, feed palatability, digestibility and animal health (Judith, 2010). Maynard and Loosli (1969) state that the higher the weight, the amount of livestock feed consumed is also higher and resulted in the faster growth rate. Cow weight gain is determined by various factors: breed, sex, age, quality of feed, amount of feed consumption, environment and genetics.

The Effect of Complete Feeding on the Percentage of Carcass and Meat at Different Ages of Male Bali Cattle.

At the end of the study, slaughtering cattle was conducted to determine the effect of slaughter age on carcass and meat percentage or amount of production of Bali beef can be seen in Table 3.

Table 3. The effect of Age on the Percentage of Carcass and Meat

<table>
<thead>
<tr>
<th>Item</th>
<th>Treatment 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Carcass Percentage</td>
<td>45.09</td>
</tr>
<tr>
<td>Meat Percentage</td>
<td>77.80</td>
</tr>
</tbody>
</table>

1) Treatment A: 1.5-2 years, B: 2-2.5 years and C: 2.5-3 years.

Table 3 shows that the highest percentage of carcass and meat obtained in Bali cattle of 2-2.5 years: carcass percentage of 49.85% and 82.27% of meat, the age group of 2.5 - 3 years with the percentage of carcass 47.28%.
% and meat 81.48%, and 1.5-2.0 years with the percentage of carcass 45.09% and meat 77.80%. Carcass of male Bali cattle in this research was lower than previous research such as carcass of Bali cattle up to 55.93% (Awaluddin, 2006), carcass percentage of male Bali cattle of 2.5-3.5 years old is 53.26% (Yosita, et al, 2012). Variation in the carcass percentage of other carcass such as male Java cattle 51.02 % (Sri Lestari et al. 2010) and carcass of Brahman cattle 54.86 ± 2.53% (Roviki et al, 2015) Those differences are due to location, breed, individual as well as research treatment. Carcass percentage of male Krui cattle is 48.09 ± 2.23% (Dewantara, et al, 2017) The percentage range of carcass in this study was from 45.09 to 49.85%. Berg and Butterfield (1978) state that factors affecting the production of an animal carcass are race, gender, age, slaughter weight, and nutrition. Suparno (1992) states that the increase slaughter weight also increases the weight of carcass and meat produced. Likewise, total meat is affected by the breed, body weight, age, degree of obesity, carcass weight, and sex hormones (Awaluddin, 2006).

IV. CONCLUSION

1. Older male Bali cattle consume more feed and higher daily gain compared to younger cattle.
2. Percentage of carcass and meat of the highest age 2 - 2.5 years, following 2.5 - 3 years and the lowest age of 1.5-2 years.

SUGGESTION

Male Bali cattle ages 2-3 years are good to be fattened by considering weight gain, high carcass and meat.

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Evaluation of Nematicidal Activity of Aloe Vera Against Meloidogyne Incognita Associated with Tomatoes in Jos North L.G.A.


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**Nigeria Stored Products Research Institute, Ilorin, Kwara State, Nigeria

Abstract- Nematicidal activity of Aloe vera plant at different concentration treatments were evaluated to determine its effect on root-knot nematode. The study was conducted at the Federal College of Forestry Jos, Plateau State of Nigeria between March and May, 2017. Nematicidal activity of Aloe vera was tested on M. incognita associated with tomatoes using 80mg/ml, 70mg/ml, 60mg/ml, 50mg/ml and 40mg/ml of the extract. Modified Baermann Funnel Method was used for nematode extractions and 70% ethanol was used for Aloe vera extraction analysis. Seedlings of the tomato plant grown in a sandy-loam soil were inoculated with 400 eggs of root-knot nematodes, Meloidogyne incognita on nursery bed. The nematicidal activity of the Aloe veraethanolic extract was evaluated based on tomato plant height, root length, shoot weight, and fruit yield. A complete randomized design (CRD) was used and data collected were analyzed using analysis of variances (ANOVA) to determine the significant differences. The results showed that there was asignificant different at p≤0.05 level. The progressive growth and yield of the tomato plant was significantly increased (compared to the control), indicating nematicidal activity of Aloe vera extract. The highest result was obtained using 80mg/ml treatments which showed tomato plant height in week one at 18.10cm, which was higher in week three at 36.30cm. There was a mark difference when compared with control treatments. The results obtained indicated Aloe vera extract contain active component that exerted inhibitory effect against nematodes, Meloidogyne incognita and can be used as a bio-control agent.

Index Terms- Lycopersicunesculentum, Nematicidal, Aloe vera, Meloidogyne incognita

I. INTRODUCTION

Tomato (Lycopersicunesculentum) is an edible red fruit of Solanumlycopersicum, belongs to the nightshade family Solanaceae.Jibia,et al., 2014 [1]. Tomato is one of the most important tropical vegetable crops widely used throughout the world. In recent years, root-knot nematodes Meloidogyne spp. problem has become a threat to tomato cultivations. Yield loss due to nematode cause diseases to nearly all plant crops of Economic importance with estimated losses of US $125 billion per year World-Wide Chitwood, 2003 [2]. They can cause significant plant damage ranging from negligible injury to total destruction of plant materials. Nematodes had long been known to attack crops but had been studied less than the insects, this is because of their minute nature. Control of root-knot nematodes has been primarily accomplished through chemical nematicides. However, indiscriminate use of chemical pesticides causes great threat to human being, animals, vegetation and to the environment as a whole due to their non-target effect, hazardous nature and besides they are expensive. So with the increasing awareness of possible deleterious effects of the chemicals, biological controls of plant pathogen have received considerable attention Gaima,et al., 2005 [3]. Leaf of Aloe vera extracts apply directly to the soil will tend to offer a more nematode control, environmentally friendly and chemical-free possibilities as there is an urgent need to replace pesticides with alternative means of control that are less toxic and more environmentally friendly. Many investigators had managed root-knot nematodes by using some plant dried powder of certain ornamental plants Akhtar and Mohmood, 1993 [4]. In this research, activity of the leaf extracts of Aloe vera is study as nematicides for the control of root-knot nematodes, Meloidogyne incognita attacking tomato.

II. MATERIALS AND METHODS

A. Sample Collection

Infected tomato plants for extraction of nematode eggs and seedlings of tomatoes used for tomatoes cultivation were collected from farms around Fari-gada area of Jos, Plateau State. The seedlings were transplanted in the nursery of Federal College of Forestry, Jos. 100g of leaves of Aloe vera plant were collected periodically from the nursery and taxonomically at the Herbarium of Federal College of Forestry, Jos.

B. Laboratory Extraction of Nematodes

The infested young plant which showed sign of stunted growth and scanty leaves were used for the nematode extraction. Large and small roots showing swelling varying from round shaped sphere-like galls to elongated spindle from large numbers of individual galls were carefully up-rooted and washed gently to remove the soil directly attaching to the tomato. Suspected galls on the root were carefully transported to the laboratory where they were excised and teased with the use of forceps and teasing pins in other to expose and release the nematode from the root tissues. The extraction of the root-knot Nematodes from the host plant roots was done using the Modified Baermann Funnel Method Southey, 1972 [5]. A regular funnel with a piece of rubber tube about 25-30cm long attached to its stem and in turn connected to the test-tube tightly held together with the aid of

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masking tape was constructed. The setup was kept in an upright position using a table stand with small regular holes and filled with distilled water to the brim of the funnel's stem. Cotton wools was placed in the funnel to assume the shape of the funnel so that the water slightly covered the wool before the teased root samples for the extraction to be place on the wool and then cover with water to prevent the samples from drying. The set-up was then allowed to stand for 24 hours. The juvenile Nematodes being very active readily passed through the cotton wool down the funnel stem and were collected at the bottom of the test-tube. The test-tubes were then carefully removed and their contents were centrifuged at 2000 RPM (Revolution per minute) for five (5) minutes in other to concentrate the nematode juveniles in the test-tubes which were then taken for examinations, four hundred (400) total number of nematode were estimated in the each test-tubes used.

C. Identification of Nematodes
Suspension of nematode extract was centrifuged at 200rpm, the residue in the test-tube of extracted nematode was dropped unto a grease-free microscopic glass slide and covered with a cover slip, then viewed under a compound microscope at low power magnification (x10) and high power magnifying lens (x40) and identify using identification aid.

D. Preparation of the Plant Material
The leaf extracts was prepare from fresh and healthy Aloe vera plant, they were cut vertically. The plants then dried at room temperature and pulverized using mortar, along with pestle and sieved into powder; using 60 mesh screensVats et al., 1995 [6]. The powdered leaves were soaked in 70% ethanol and was left to stand for 72 hours (3days) and then filtered using Whatman’s filter paper No. 3Ogundare, 2007 [7]. Water was allowed to evaporate from the filtrate using hot plates at a temperature of 50°C suitable for even evaporation while still maintaining the active components within the filtrates especially the heat labile ones. The resultant powdered extracts were collected and then used for the nematicidal tests. Different concentrations of the leaf Extracts were prepared by dissolving variable concentration of the extracts in distilled water as follows:

1. 0.8g of Aloe vera to 10ml of distilled water
   
   0.8g in 10ml = 0.08g/ml
   
   =80mg/ml

2. 0.7g of Aloe vera to 10ml of distilled water
   
   0.7g in 10ml = 0.07g/ml
   
   = 70mg/ml

3. 0.6g of Aloe vera to 10ml of distilled water
   
   0.6g in 10ml = 0.06g/ml
   
   = 60mg/ml

4. 0.5g of Aloe vera to 10ml of distilled water
   
   0.5g in 10ml = 0.05g/ml
   
   = 50mg/ml

5. 0.4g of Aloe vera to 10ml of distilled water
   
   0.4g in 10ml = 0.04g/ml
   
   = 40mg/ml

E. Planting of Tomato and Determination of Nematicidal Activity

Two weeks old seedlings of tomato planted obtained from Faringada was transplanted in nursery of Federal College of Forestry in six different pots containing sterilized loamy soil. Three blocks in area of about 300m² partitioned into five (5) plots with 1m alley each in-between plots and blocks, was prepared, this was done to avoid treatments interaction. Each plot was 50m² for one treatment between the tested nematicidal extract. Four hundred (400) total numbers of the estimated nematode were thoroughly mixed with the plots soil to which the transplanted tomatoes was planted. Various concentrations (80mg/ml, 70mg/ml, 60mg/ml, 50mg/ml, 40mg/ml) of extract were applied by bare surface placement at 3cm into the soil and 1cm away from the tomato plant after 21days of nematode inoculation. 5milliliters (5ml) each of the concentrations was applied per plant and the plants were watered regularlyJibia et al., 2014 [1]. Tomato plants that were treated with water only served as the control. Each treatment was replicated four (4) times and laid out in a randomized complete design. Plant height, fruit yield, shoot weight and root length at final harvest were recorded. The growing plant in each plots were examined at intervals of three weeks for three mouth.

III. PARAMETERS

A. Plant Height (cm)
The plant height were obtained by taking measurement (cm) of plant height in each plot in the nursery using a measuring tape. The data were recorded at interval of two (3) weeks in three (3) replicates.

B. Root Length (cm)
The root lengths were obtained by taking measurement (cm) of root length in each plot in the nursery using a measuring tape. The data were recorded at interval of two (3) weeks in three (3) replicates.

C. Shoot Weight (g)
The shoot weights was obtained using the weighing balance in which the shoot was un-plucked and weighed. The data obtained were recorded at interval of two (3) weeks in three (3) replicates.

D. Fruit Yield of Plant
The plant yields were obtained by counted with hand fruit yield within each plots in the field. Data obtained were recorded at interval of two (3) weeks in three (3) replicates.

IV. DATA ANALYSIS

Data collected were analyzed using analysis of variance, ANOVA to determine the significant difference between the concentrations of the Aloe vera plant extract and mean separation were made using Duncan multiple ratio test, DMRT.

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V. RESULTS AND DISCUSSION

A. Results

Table 1: Identification of nematodes

<table>
<thead>
<tr>
<th>Nematode</th>
<th>Microscopic Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Juvenile</td>
<td>- Head not offset with truncated cone shape when viewed laterally.</td>
</tr>
<tr>
<td></td>
<td>- Stylet knob is prominent and rounded.</td>
</tr>
<tr>
<td>Adult male nematode</td>
<td>- The head is not offset with a high truncate cone shape.</td>
</tr>
<tr>
<td></td>
<td>- The head cap is clearly annulated.</td>
</tr>
<tr>
<td></td>
<td>- The head cap is with stepped outline in lateral view.</td>
</tr>
<tr>
<td></td>
<td>- Annule number behind head cap very variable usually 1-3 on sub-lateral head sector.</td>
</tr>
<tr>
<td></td>
<td>- Conus of stylet longer than shaft.</td>
</tr>
<tr>
<td></td>
<td>- Stylet knob is prominent usually of greater width than length with flat concave or toothed anterior.</td>
</tr>
<tr>
<td>female Adult nematode</td>
<td>- The body is spherical with projecting neck.</td>
</tr>
<tr>
<td></td>
<td>- Head with 2 or 3 annule behind the head cap.</td>
</tr>
<tr>
<td></td>
<td>- The cuticle thickening at base of relaxed stylet.</td>
</tr>
<tr>
<td></td>
<td>- Stylet knobs are drawn out laterally.</td>
</tr>
<tr>
<td></td>
<td>- Dorsal arch is high and rounded.</td>
</tr>
</tbody>
</table>

Table 2: Evaluation of Nematicidal effect of Aloe vera extract base on tomato length

<table>
<thead>
<tr>
<th>Treatment (mg/ml)</th>
<th>Plant height (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Week 3</td>
</tr>
<tr>
<td>80</td>
<td>18.10(^a)</td>
</tr>
<tr>
<td>70</td>
<td>13.00(^b)</td>
</tr>
<tr>
<td>60</td>
<td>12.20(^b)</td>
</tr>
<tr>
<td>50</td>
<td>10.00(^bc)</td>
</tr>
<tr>
<td>40</td>
<td>8.00(^c)</td>
</tr>
<tr>
<td>Control</td>
<td>7.00(^c)</td>
</tr>
<tr>
<td>SE±</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Mean followed by the same superscript in a column are not significantly different from each other.

Table 3: Evaluation of Nematicidal effect of Aloe vera extract base on tomato root length

<table>
<thead>
<tr>
<th>Treatment (mg/ml)</th>
<th>Root length (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Week 3</td>
</tr>
<tr>
<td>80</td>
<td>9.00(^a)</td>
</tr>
<tr>
<td>70</td>
<td>5.10(^b)</td>
</tr>
<tr>
<td>60</td>
<td>4.10(^bc)</td>
</tr>
<tr>
<td>50</td>
<td>2.00(^cd)</td>
</tr>
<tr>
<td>40</td>
<td>2.00(^cd)</td>
</tr>
<tr>
<td>Control</td>
<td>1.27(^d)</td>
</tr>
<tr>
<td>SE±</td>
<td>0.67</td>
</tr>
</tbody>
</table>

Mean followed by the same superscript in a column are not significantly different from each other.
flavonoids either singly or in combination inhibited of botanical extract that contained alkaloids, saponins and [14], Ranjitsingh, et al., reported by Adegbite, 2003 [13], Adegbite and Adesiyan, 2005 an additive effect of nutrients produced. It was also earlier increased plant growth parameters and yield and may be due to Ramesh, et al. test plant extracts of A. officinale that contained different concentration of the extracts and rate of application of different concentration of the extracts and extent of nematode population reduction was dependent on the time of exposure, inhibition of of M. incognita resulted in significant improvement in the tomato growth rates of A. officinale 

Mean followed by the same superscript in a column are not significantly different from each other. 

**Table 5: Evaluation of Nematicidal effect of Aloe vera extract base on tomato yield**

<table>
<thead>
<tr>
<th>Treatment (mg/ml)</th>
<th>Fruit Yield</th>
<th>Week 3</th>
<th>Week 6</th>
<th>Week 9</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>6.00&lt;sup&gt;a&lt;/sup&gt;</td>
<td>16.00&lt;sup&gt;a&lt;/sup&gt;</td>
<td>27.00&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>4.00&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>14.00&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>24.00&lt;sup&gt;ab&lt;/sup&gt;</td>
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<td>60</td>
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<tr>
<td>50</td>
<td>3.00&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>13.00&lt;sup&gt;ab&lt;/sup&gt;</td>
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<td></td>
</tr>
<tr>
<td>40</td>
<td>2.00&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>22.00&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>6.00&lt;sup&gt;a&lt;/sup&gt;</td>
<td>16.00&lt;sup&gt;a&lt;/sup&gt;</td>
<td>26.00&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>SE±</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Mean followed by the same superscript in a column are not significantly different from each other.

B. Discussion

Poor yield of tomato has been attributed to nematode diseases Stone, et al., 2000 [8] and tomato plants are highly susceptible to Meloidogyne incognita Agbenin, et al., 2004 [9]. The result on Table 1 showed that Meloidogyne incognita identify has distinctive features such as head not offset with truncated cone shape, stylet knob prominent and round, conus of stylet longer than shaft. Similar report been made by Orton Williams, 1973 [10] showed M. incognita body is spherical with projecting neck, in lateral view, stylet knob are drawn out, the head is clearly annulated, conus of stylet is longer than shaft. The increase in plants parameters such as the plant height, root length, fruit yield and shoot weight shown in Table 2, 3, 4 and 5 suggests that the ethanolic extracts of Aloe vera used in this work have potential nematicidal effect on the root knot nematodes (Meloidogyne incognita). Jibia et al., 2014 [1] reported that the test plant extracts of A. indica leaf, C. annuum fruit, Z. officinalis thizone, P. biglobosseed on the micro plots suppressed the population root knot nematodes in tomato. The extent of nematode population reduction was dependent on the rate of application of different concentration of the extracts and time of exposure, inhibition of M. incognita reproduction resulted in significant improvement in the tomato growth parameters and yield, a similar report by Alam, 1991 [11]; Ramesh et al., 2008 [12] that plant powder treated plant showed increased plant growth parameters and yield and may be due to an additive effect of nutrients produced. It was also earlier reported by Adegbite, 2003 [13], Adegbite and Adesiyan, 2005 [14], Ranjitsingh et al., 2009 [15] and Umar, 2013 [16] that botanical extract that contained alkaloids, saponins and flavonoids either singly or in combination inhibited of Meloidogyne spp. In a related work Ferreira, et al., 2013 [17] reported that aqueous extracts of zinnia peruviana and Wedelia species inhibited Meloidogyne incognita when compare to the control by 92.72% and 97.48% respectively. Khan, et al., 2008 [18] reported that extracts of some plants such as onion, garlic, tobacco, cloves and chill were effective against M. incognita larvae and caused mortality of juveniles between 82-100%. The ready availability of the organic materials used in this study, its effects on nematode population, plant growth and yield suggest the need for additional studies in the field to evaluate the efficacy and economics for it use in nematode management. It was established in this work that soil treated with the ethanolic extracts had higher reduction in the population of M. incognita, which is opposed to that of control experiment in which untreated plants shows significance difference (p> 0.005) with an increased poor fruit set up and swollen root galls. Abulusoro, 2004 [19] reported that the susceptibility in tomato plants infected with root-knot nematodes (Meloidogyne spp.) show stunted growth, yield loss and conspicuous root galls, but a number of plants are thought to contain biologically active ingredients which when applied in the soil reduced the incidence of plant parasitic nematodes. The responses to pesticide treatment were not compared directly with the results obtained from extract of Aloe vera plant tested, because this material showed promising outcome.

VI. CONCLUSION

The results obtained showed the nematicidal content of the extracts inhibited nematodes. The effect of the different extracts of the botanical on the performance of tomato was
significantly different at 5% level of probability. Tomato crop treated with different concentration recorded taller plant, longer root, higher shoot weight and high yield. The treated plant recorded better growth parameters and fewer nematodes due to the nematicidal or nemostatic effect of the different concentrations of extract. It was reported that extracts of plant containing tannins, alkaloids and flavonoids were effective against root-knot nematodes both in-vivo and in-vitro (Adegbite and Adesiyan, 2005, Anuja and Satyawati, 2007 and Umar, 2013. The result of the study indicated that 80mg/ml was more effective against M. incognita and hence improved tomato growth and yield. Although, others treatment were also able to reduced nematode population and were not as effective as the 80mg/ml. Further work should be conducted to determine the actual active ingredient and purify

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The Dual Pathways in the Process of Urban Development and their influence on Flood Damage in Kisumu City, Kenya

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Abstract- Urban flooding is becoming an increasingly severe and more frequent problem in African cities. The floods result into loss of lives and damages to properties in these urban places. Vulnerability to flood damages has been explained to be related to the manner in which urban settlements develop. Particular processes of urban development, especially in developing countries, where plans follow rapid urban growth, rather than direct it, have been blamed for the increased vulnerability to flood damage. Potential impacts of climate changes are expected to exacerbate this urban flood menace. This therefore necessitated a study of this nature so as to explore the dichotomous pathways in urban development process and how they contribute to the rise in flood damage. This would in turn enable us confront such processes through appropriate urban development planning framework.

Index Terms- Dual pathways; Flood damages; Urban development; Spatial patterns.

I. INTRODUCTION

Urban flooding is becoming an increasingly severe and more frequent problem in African cities. Many of these cities have experienced extreme flooding since 1995 (Douglas, et al, 2008). The floods result into loss of lives and damages to properties in these urban places (Sanderson, 2000). Increased flood damages in urban areas in Africa have been evident over the last few decades (Munich Re, 2011 cited in IPCC, 2012). This therefore means that where urban areas were once seen as place of safety, they are now the hub of modern flood risks (Wilby & Keenan, 2012). The reasons for the increased flood damages are several and correlated. Potential climate changes are expected to cause a rise in the frequency and intensity of rainfall thereby exacerbating the urban flood menace (IPCC, 2012). Although there is an expectation that climate change will increase the magnitude and frequency of flood events, the damages by flooding depend on a host of site-specific factors (Wilby & Keenan, 2012). Authors like Brody, et al (2007) and Douglas, et al (2008) point out that the rising flood-related damages in urban areas is not just related to increases in annual mean precipitation, rather, it is also related to the manner in which urban settlements develop.

Through processes of growth and expansion, urban areas transform their environments and their surrounding hinterlands and may generate and create new hazard patterns (UNDP, 2004; IPCC, 2102). These processes of urban development do not explain vulnerability to flood damage per se. It is particular processes of urban development that increase vulnerability to flood damage. These processes vary considerably from context to context and yield different patterns of settlement (UNDP, 2004). In developing countries where plans follow rapid urban growth rather than direct it, unplanned urban development is common (Jha, et al, 2013). This poorly planned and managed urbanization play a major role in increasing flood damages in these countries over the last few decades (IPCC, 2012).

Generally, two paths in the process of urban development exist in Kenya. On one hand, we have the formal urban development process that begets conventional urban patterns and layouts. While on the other, there is the informal urban development process that creates irregular and disorganized patterns. The question that can be asked is: How do these two pathways in urban development process emerge and how do they shape flood damages? Although a number of authors have researched on the different urban development pathways in Kenya (Anyamba, 2006; Anyumba, 1995; Ayonga, 2008; Esso, 2009; Majale, 1998), rarely have they ventured into their contribution in configuring flood damages. This study therefore attempts to fill this hiatus by exploring the dual pathways in the process of urban development and examine their influence in shaping flood damages in Kisumu city.

II. AREA OF STUDY

Kisumu city is located on the western part of Kenya in Kisumu County. The city is situated between longitudes 00° 06’ south of the Equator and latitudes 34° 35’ and 34° 55’ east of Greenwich (Anyumba, 1995; Mireri, et al, 2007). It is sited at the eastern extremities of Lake Victoria referred to as Winam Gulf and it is bordered to the north by the Nandi escarpment which rises to over 2000 metres above sea level; Lake Victoria to the southwest with an elevation of about 1140 metres above sea level; and Kano plains to the east (Anyumba, 1995; Mireri, et al, 2007). It receives mean annual rainfall of 1245 mm occurring in two seasons; the long and the short rainy seasons, occurring
during March-June and October-November periods respectively (Mireri, et al, 2007).

**Fig. 1** Map of Kenya showing location of Kisumu city  
*Source: Maoulidi, (2011)*

**Fig. 2** Map of Kisumu city  
*Source: Department of Physical Planning, 2015*
III. RESEARCH METHODOLOGY

This research was conducted in two stages with the first stage laying the ground and providing a base for the second one. The first phase of this research entailed desktop survey where secondary data were collected. This survey essentially involved the review and analysis of the existing planning legislations, statutes and policy documents which contain provisions relating to urban planning and development in Kenya generally and in Kisumu city in particular. The review further focused on the historical urban development and the creation of spatial patterns in Kisumu city. Published and unpublished data related to the urban development processes of residential areas in Kisumu city were collected from the department of town planning of Kisumu city authority, Department of Physical Planning and Department of Surveys both of the Ministry of Land, Housing and Urban Development. The primary goal that was realized by this desk research approach was the conceptualization of the urban development processes and creation of spatial patterns in Kisumu city.

The second phase of this research entailed collection of primary data, through household surveys, key informants interviews as well as observation. During the household survey, data was collected through personal interviews using a semi-structured questionnaire with the heads of the households. Open-ended interview schedules were used to collect data from the key informants.

Household surveys yielded data on flood damage and/or loss. To measure the household damage or loss, types of self-reported data were collected. These included the total estimated loss in terms of money; the respondents were asked to report self-evaluation on the level of household damage to cloths, furniture and other household items, as well as the building itself. These questions were measured on a 4-point scale including: never suffered inundation by floods, no damage, minor damage and total damage.

While purposive sampling was used to pick the key informants, the sampling technique used to choose households to be interviewed involved a combination of stratified-sampling and systematic random sampling. The entire city was first stratified into two spatial units which covered both planned and unplanned settlements. In the planned (formal) settlements, Migosi was purposively selected since it was a planned settlement located in a potentially flood-prone area. The unplanned (informal) settlements were categorized further into two. These were the areas that have undergone upgrading process, of which Manyatta was selected; and those areas that have not experienced any form of intervention, where Nyamasaria was selected. In each of these sampling areas, systematic random sampling was used. In Migosi, a random sample was derived from the Kisumu Municipal plot register. While, for both Manyatta and Nyamasaria, where growth is organic, transect lines were established parallel to the major roads with an interval of about one kilometre. A transect walk was made to determine and mark the households after which simple random sampling was used to sample the households for the study.

For the analysis of household data, particularly on damages suffered in the past during a flood event, ordinal logistic regression was applied. Ordinal logistic regression was used to predict an ordinal dependent variable (extent of damage by floods in the past) based the independent variable settlement type. Using SPSS, the ordinal logistic procedure was applied using the Polytomous Universal Model (PLUM) procedure.

IV. THE ORIGIN OF DUAL PATHWAYS IN DEVELOPMENT PROCESSES AND VARIATION IN URBAN PATTERNS IN KENYAN URBAN AREAS

The prevailing urban spatial patterns in Kenya trace their origins from the British colonial urban development policies (Home, 2012). The colonization of Kenya by the British heralded the transfer into the country of the urban planning systems that had evolved in Europe over the years. Wherever they settled in Kenya, the colonialist established urban cores which formed the settlement areas of the Europeans. Native Kenyans were not allowed to reside within these core urban areas. Instead, they established their own settlements outside the township boundaries (Home, 2012).

The European settlements forming the core urban areas conformed to the standards of construction and urban development that were in existence in Europe at that time. However, the application of the planning principles and techniques were restricted only to these European settlements while the native Kenyans were left to their own devices in terms of construction and occupation of houses within their settlements (Otiso, 2005). In other words, whereas the European settlement areas took the planned urban development pathway, the native settlements deviated from this and took a divergent pathway where development preceded planning. This marked the beginning of duality in development processes and subsequent variation in spatial patterns in urban areas in Kenya.

As the towns and urban areas in Kenya grew in population and expanded, the contiguous lands where the native settlements existed were inevitably engulfed to accommodate the expansion and development. However, this expansion into peripheral lands created a situation where two distinct urban spatial patterns that had evolved separately were brought together within the same township boundary.

Another complication brought about by this expansion and incorporation of native settlements into the township boundary was the nature of tenure. Whereas the land occupied by the core urban areas was state land under government leasehold control, those that were outside the township boundaries where the natives lived, were the reserves or trust lands (Home, 2012). Accordingly, while it was possible for planned development to take place on the leasehold land within the core urban areas, it proved quite impractical on the native settlement areas where land was held under customary laws (Majale, 1998).

After Kenya gained independence in 1963, the successive governments proved unable to undo the colonial urban development policies that created duality in urban development. Instead, the trends in urban development that ensued after independence tended to reinforce the old structural and spatial patterns (King, 1976). As such, the physical-spatial characteristics of the colonial towns to a greater extent remain unchanged. Such spatial patterns are exemplified by the existence of core urban areas whose developments are planned and regulated and the surrounding peripheral areas which have not benefitted from planned growth. Over the year, attempts have
been made to address the dissimilar urban spatial patterns existing within the same urban area through informal settlement upgrading. Nonetheless, even with the provisions of some form of infrastructure and attempts at planning, the spatial patterns in those former native settlements remains largely unchanged.

V. RESULTS, FINDINGS AND DISCUSSION

5.1 Urban development processes in Kisumu city and the creation of dissimilar spatial patterns

The findings of this study indicate that there are two parallel urban development processes operating side by side in Kisumu city leading to variation in urban spatial patterns. The first is the formal or pre-planned development process while the second is the informal or unplanned urban development process.

The formal or pre-planned urban development occurred in Migosi settlement. This formal development process commenced with the preparation of a local physical development plan (LPDP) for the site-and-service scheme. The prepared plan was approved by the relevant approval authorities before it could be implemented. This preparation of a plan set the basis for the pre-planned urban development with its pre-determined spatial patterns (figure 3 presents an example).

![Fig. 3 Copy of part of the plan for Migosi settlement showing regular spatial patterns](source)

**Source:** Department of Physical Planning - Kisumu Office

The second stage of the pre-planned development that obtained in Migosi was, servicing, which entailed provision of infrastructure and utilities such as storm water drainage system, roads and water reticulation system, among others. Once servicing was completed, the land was ready for construction of buildings, the third step in the pre-planned urban development process of the Migosi settlement. The construction of buildings was a subject to checks and permit systems by the urban authority. The permit system entailed the review, inspection and approval of proposed construction to secure compliance with the building code. In addition, the urban authority ensured that each building plot had adequate buildable area outside the floodway or any other area subject to flooding. Similarly, during the construction process, the urban authority ensured that the buildings were sited on the highest practical site of the plot so as to prevent inundation by floods.

The final step in the development process in Migosi settlement was the occupation of the buildings that had been constructed. For this to be done, issuance of certificate of occupancy by the urban authority was mandatory. Such issuance meant that the structure was suitable to occupy from a safety point-of-view including propensity to flood risk. The development process in Migosi settlement thus followed the Plan-Service-Build-Occupy (PSBO) pathway. This PSBO pathway creates conventional urban spatial patterns as envisaged in urban planning policy and legislative framework. It is argued that such spatial patterns have in-built risk reducing attributes. The development process is schematized in figure 4.
The second form of urban development process that prevails in Kisumu city is the informal or organic urban development process. This form of urban development, explored by analyzing the cases of Nyamasaria and Manyatta, traces its origin to colonial period when the settlements were outside the township boundaries (Home, 2012). The emergence of these settlements is tied to the policies of racial exclusion and segregation phenomenon of the colonial of township. Both settlements fall in what was the Kavirondo Native Land Unit, which was created through the Native Trust Lands Ordinance 1930 for the native African population. Land rights within these land units were governed by native law and custom, hence customary law on ownership of land prevailed (Home, 2012).

Since they were originally outside the township boundary, the development process of the two settlements was never a concern for the colonial government. Instead, the initial development of these settlements was superintended by the customary laws. When Kenya gained independence, there was registration of the lands in the native land unit where both Nyamasaria and Manyatta were located. The method of registration involved preparation of a map called Registry Index Map (RIM) in which all the pieces of land in an area were shown and numbered. A registered land owner was issued with a title deed as a proof of absolute ownership. After the registration, customary law ceased to apply to land in that registered area.

Nyamasaria and Manyatta settlements sprang from the parcels created through adjudication and surveying that were reflected in the RIMs. However, this process of adjudication and surveying without a prepared plan yielded land parcels that had marked disparities in terms of size, shape and arrangement. Because of this, the parcels of land which are considered as plots in these two settlements are arranged in distorted spatial patterns and irregular layouts arising from urban blocks of different sizes and shapes. It should be noted that even after the registration of the land, the owners still retained absolute ownership and any form of development was not subject to urban authority regulations or control. Therefore, control over subsequent land subdivision and construction of buildings within these former native settlements were technically beyond the jurisdiction of the urban authority. Instead, land subdivision for urban development was largely driven and controlled by land owners or developers. Because of this, informal subdivision of land for urban development ensued during the process of development of both Nyamasaria and Manyatta. The informal subdivision led to creation of spatial patterns that are distinctly different with those of regulated subdivisions (figure 5 presents an example).
The construction of buildings in Nyamasaria and Manyatta took the rural-type build and occupy pathway. The landowners or developers never sought permission from the urban authority before construction, since local physical development plans that specify zoning requirements did not exist. Houses were built mainly through self-construction and in most cases would be done through incremental processes. Once the construction of buildings was done, occupation of the structures that had been built immediately followed. Given that this whole process of development was largely informal, the occupation of buildings also proceeded informally without any form of authorization. Indeed there were instances where buildings were occupied even before the construction was fully completed. For example, in cases where the construction was incremental, examples abound of occupation preceding completion of the house construction.

After the construction of buildings and occupation had been done, the developers or occupiers informally connected utility services to the existing structures within the settlements. Such processes were organized by the individual households or owners of the buildings well after the construction and occupation of the building had occurred. This, however, does not apply to all buildings within these settlements. There are some buildings that are not connected to the utilities such as electricity and piped water. These settlements that developed informally may, after sometime, be subjected to upgrading. This is what happened to part of Manyatta settlement. Whenever such process is undertaken, it encompasses further servicing, including provision of roads and drainages among other improvements, a form of what may aptly be referred to as reactionary planning. Nonetheless, such reactionary ‘planning’ did little to address the spatial patterns created by decades of informal development. The development process in Nyamasaria and Manyatta settlements follows the Build-Occupy-(SP) (BO-SP) pathway. This BO-SP pathway produces urban spatial patterns that are typically different from those envisaged in urban planning policy and legislative framework in Kenya. The development process is illustrated in figure 6.

**Fig. 6 Illustration of the informal urban development process in Kisumu city**

*Source: Authors’ construct*

### 5.2 Damages suffered in the past after inundation by floods in the settlements

The study sought to find out if households residing in the three settlements had suffered damages in the past 10 years during a flood event. Floods usually damage buildings through two general mechanisms; structural damages from the force of floodwaters and the unsuitable building materials that are damaged by contact with water. From the household survey, Migosi settlement had no respondent that had suffered total destruction to his/her house during a flood event. Only about 20% of those who had suffered inundation by floods in the past reported to have suffered minor damages to their properties (table 1). Minor damage to house/properties took the form of damage to the household items, as well as parts of the building such as the walls becoming damp and mouldy and wooden doors swelling and refusing to shut.

In Nyamasaria settlement 26% of home-owners living on their ancestral land and 19% home-owners who bought land and built homes had suffered total damage to their houses. Similarly about 3 per cent of the respondents living in rented accommodation reported having suffered total damage to their rented premises within the settlement during a past flood event. Total damage in this case involved major structural damage including washing away of walls resulting in the collapse of the house and complete destruction of the dwelling. The field survey also established that there were other households that had suffered minor damages to their houses/properties during a past flood event. About 18% of the home-owners who built houses on their ancestral lands reported having suffered minor damages to their houses. Another 12 per cent of home-owners who bought land and built houses responded that they had suffered minor damages to their houses during a past flood event. For the renters, 22% indicated that they had suffered minor damages to the houses and their properties. Minor damages occurred when flood water seeps into the houses through the door causing property damage such as degradation of floors, wall and personal belongings including mattresses and cloths.

In Manyatta, there were no home-owners who reported to have suffered total damage to their house/properties during a past flood event. However, over 62% of them reported to have suffered minor damages to their houses and properties during a past flood event. For those living in rented houses, 1 per cent responded to have suffered total damage to their houses/properties during a flood event in the settlement in the past. This rises to 13% among those living in rented houses in the settlement.
Table 1 Extent of damage during a past flood event

<table>
<thead>
<tr>
<th>Home-owners</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never experienced inundation</td>
<td>Inundation with no damages</td>
</tr>
<tr>
<td>Nyamasaria</td>
<td>00</td>
<td>35</td>
</tr>
<tr>
<td>Migosi</td>
<td>10</td>
<td>01</td>
</tr>
<tr>
<td>Manyatta</td>
<td>01</td>
<td>02</td>
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Renters

<table>
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<th>Home-owners</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never experienced inundation</td>
<td>Inundation with no damages</td>
</tr>
<tr>
<td>Nyamasaria</td>
<td>07</td>
<td>50</td>
</tr>
<tr>
<td>Migosi</td>
<td>130</td>
<td>07</td>
</tr>
<tr>
<td>Manyatta</td>
<td>66</td>
<td>66</td>
</tr>
</tbody>
</table>

Source: Field Survey, 2014

5.3 Ordinal Logistic Regression

To determine the prediction of the extent of damage by inundation by floods in the past in the various settlements, ordinal regression was used. The procedure was done through Polytomous Universal Model (PLUM) with extent of damage suffered during a past inundation by flood being the dependent variable and settlement type (Place of Residence - PLAOFRES) being the independent variable. Our interest here was to determine the direction of the relationship between the variable settlement type (PLAOFRES (0) = Formal- Migosi; PLAOFRES (1) = Informal upgraded- Manyatta and PLAOFRES (2) = Informal without intervention- Nyamasaria) and the ordinal nature of the categorical dependent variable (extent of damage by floods in a past event). The table of the model fitting information (table 2) shows the difference between the two log-likelihoods. The chi-square has an observed significance level of less than 0.005 ($\chi^2 = 33.697$, df = 2, p< 0.005). This means that is possible to conclude that the model without the predictor is not as good as the model with the predictor.

Table 2 Model fitting information for extent of damage and settlement type

<table>
<thead>
<tr>
<th>Model Fitting Information</th>
<th>-2 Log Likelihood</th>
<th>Chi-Square</th>
<th>df</th>
<th>Sig.</th>
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<td>Intercept Only</td>
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<tr>
<td>Final</td>
<td>25.129</td>
<td>33.697</td>
<td>2</td>
<td>.000</td>
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</tbody>
</table>

Link function: Logit.

Source: Authors’ analysis

The parameter of estimates table (table 4) show that PLAOFRES (0) is a significant predictor of the dependent variable (Wald = 16.680, df = 1, p< 0.001). The coefficients of the predictors are negative. This means that they are associated with poorer scores on the extent of damage by past flood event. For instance, an increase toward PLAOFRES (0) results in an odd ratio of $\exp (-4.568) = 96.351$ times decrease in odds of being in the higher category of extent of damage by past flood event. Similarly, an increase toward PLAOFRES (1) results in an odd ratio of $\exp (-0.131) = 1.139$ times decrease in odds of being in the higher category of extent of damage by past flood event. In other words, an increase toward place of residence being formal leads to 96.351 times decrease in odds of being in the higher category of extent of damage by past flood event. Nonetheless, an increase in a place of settlement being informal but upgraded result in only 1.139 times decrease in odds of being in the higher category of extent of damage by floods in the past. This suggests that if informal settlement is upgraded then the odds of being in higher category of extent of damage by floods become lower than when there is no intervention in the informal settlement. These results are a clear pointer to the fact that flood damage is not solely a function of rainfall, but is also driven by the settlement which is a product of urban development process. Thus, damages by floods are largely influenced by how a settlement is planned, designed and constructed.

Table 3 Pseudo R-square table

<table>
<thead>
<tr>
<th>Pseudo R-Square</th>
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<tbody>
<tr>
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<td>.326</td>
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<td>McFadden</td>
<td>.134</td>
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</table>

Link function: Logit.

Source: Authors’ analysis

The Pseudo R²values (e.g. Nagelkerke = 0.326) (table 3) shows that the independent variable explain a significant portion of the variation in extent of damage by floods in the past. For example, place of residence of households explains about 33% of the variation in extent of damage by floods in the past. The rest is explained by other factors not included in the model.
The urban development processes that occurred in Nyamasaria and Manyatta settlements were not based on any prepared physical development plan. Instead, such development sprang from parcels of land created through adjudication and surveying. With the development in these two settlements proceeding without a plan, preventing occupation of unsafe areas has proved to be practically impossible. This, coupled with neglect of floodwater drainage infrastructure, has seen vulnerability to flood risk escalate over time in these settlements. Moreover, the construction of buildings in these two settlements is not necessarily subjected to the check and permitting system of the urban authority. This means that the buildings may not necessarily comply with the requirements of the building code which stipulates building safety standards. The uncontrolled development together with the unregulated constructions combine to make Nyamasaria and Manyatta vulnerable to flood risk as evidenced by the damages suffered by households during past flood events.

### VI. CONCLUSION

This study has established that there are two parallel development processes operating side by side in Kisumu city. These are the formal or PSBO-led urban development process and the informal or BO-SP-led urban development. Migosi settlement underwent the formal development process which commenced by preparation of a plan. This pre-planned development has worked toward mitigating flood risk because of inherent attributes including the requirement to provide for storm water drains and zoning regulations. While the provision of storm water drains has ensured that floodwater is collected and safely conveyed out of the settlement, the zoning regulations spelt out by the plan assisted in steering development away from potentially hazardous areas. Likewise, since it is a formal settlement, the construction of buildings in Migosi was subjected to the check and permitting system of the urban authority. Such buildings whose construction complied with the building code have in-built resilience and perform better structurally during any flood event. This explains why residents of Migosi do not suffer inundation by floods and the few who are affected by inundations do not suffer damages to their properties.

In contrast, the urban development processes that occurred in Nyamasaria and Manyatta settlements were not based on any prepared physical development plan. Instead, such development sprang from parcels of land created through adjudication and surveying. With the development in these two settlements proceeding without a plan, preventing occupation of unsafe areas has proved to be practically impossible. This, coupled with neglect of floodwater drainage infrastructure, has seen vulnerability to flood risk escalate over time in these settlements. Moreover, the construction of buildings in these two settlements is not necessarily subjected to the check and permitting system of the urban authority. This means that the buildings may not necessarily comply with the requirements of the building code which stipulates building safety standards. The uncontrolled development together with the unregulated constructions combine to make Nyamasaria and Manyatta vulnerable to flood risk as evidenced by the damages suffered by households during past flood events.

### RECOMMENDATION

This study sought to explore the dual pathways in the process of urban development and their influence on flood damage in Kisumu City. Results confirm that the dual pathways in development processes indeed play a role in creating variations in urban spatial patterns. The areas that underwent formal urban development or PSBO pathway had typically different spatial patterns from the areas that grew organically or underwent BO-led urban development process. This variation in urban spatial patterns has, in turn, engendered disparity in flood damages among various settlements. Whereas, formal settlements are more resilient to flood risk, informal settlements are more vulnerable to flood risk. In view of the foregoing therefore, this study makes the conclusion that urban flood risks are explainable product of failures in urban development in Kisumu city.

Results demonstrate that urban flood risk in Kisumu City is a direct consequence of the use of urban land. Therefore, efforts to reduce the risk must logically occur within the context of land use planning. This study recommends that, as a necessity, urban development policies should address the ongoing informal urban development processes which create perilous urban patterns that increasingly expose the inhabitants to flood risk. Hence, the key elements in the prevention of flood risk are the proper land use planning of the settlements, provision of risk-reducing infrastructure and building control.

### ACKNOWLEDGMENTS

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CONFLICT OF INTERESTS

The author declares no conflict of interests.

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How to Develop Company Performance Appraisal System in Highly Regulated Business Sector: Case Study of Commercial Explosives Producer

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ABSTRACT

This research aims to learn on how to develop company performance appraisal systems in business sector that is highly limited by government regulations. The object of study is PT XYZ that is running business in commercial explosives production and distribution in Indonesia. The performance appraisal will be developed based on Balanced Scorecards (BSC) concept. The objectives of the research is analyzing the internal factor and external factor of the company, and developing a strategy map based on the BSC perspectives, and developing performance appraisal system for the company. Company strategy components such as vision, values and main strategy will be integrated in to the process to get final appraisal systems that is in line with internal company values and capable to support the company to overcome the external challenges. The benefit of this research is to assist the company in developing a strong and solid internal system in order to be able to run the explosive business on an ongoing basis. Customer perspectives is the most prioritized items in the appraisal systems in this type of business due to limited number of customers, high volatility of the customer business situation which is mining industry and high level of business competition. Customer perspectives is also represent most of external factors including how the company anticipate the business regulation changes which is oftenly unpredictable.

Keywords: Performance Appraisal, Key Performance Indicator, Strategy Map, Explosives

I. BACKGROUND

Research by Kaplan and Norton (2001) as quoted by GoodSpeed(2003) identified four barriers to implementing strategy as (1) the vision barrier, research found that only 5% of the workforce understands the strategy, (2) the management barrier in which 85% of executive teams spend less than one hour per month discussing strategy, (3) the resource barrier in which 60% of organizations do not link strategy to resources or the budget and (4) the people barrier in which only 25% of managers have incentives or compensation linked to strategy. It would take a comprehensive concept to build a company strategy as well as giving guidance to implement the strategy.

PT XYZ is a producer and supplier of commercial explosives in Indonesia, a subsidiary of XYZ international which is a global explosives business company. Explosives business has been highly regulated in most country due to its destructive physical property. Unproper explosive application may potentially cause catastrophic damage to physical facilities as well as significant number of life loss. On the other hand explosives is significantly required by mining and civil industry as it is still considered as the most effective and efficient ground breaking tools. Commercial explosive business is classified as oligopoly market due to its limited involved parties and high barrier to entry and barrier to exit.

Current issue of PT XYZ is mainly related to decline in mining business which is the biggest customer of commercial explosives in Indonesia. This situation tend to increase level of explosives business competition which is mainly caused by reduction of market volume without significant change on market player numbers. PT XYZ needs a comprehensive performance appraisal systems to help the company to strengthen its internal resource and increase its competitiveness in the business.

The concept of Balanced Scorecards (BSC), since it was initiated by Kaplan and Norton (1992) has been applied by profitand non-profit oriented companies and organizations to build strategies and analyze the implementation of those strategies. Wisniewsky and Olaffson (2004) reveal that the BSC concept helps organizations to face the pressure of improving performance and demonstrating such improvements through effective performance measurement. The BSC concept sees organizations from four perspectives namely (1) Financial, (2) Customer, (3) Internal Process and (4) Learning and Growth. In broader applications BSC is more
flexible, according to Craig and Moore (2005) The BSC concept is not narrow and allows users to change or add new dimensions. Abernathy (1997) describes the steps in implementing the strategy using BSC. The first step is to translate strategy into concrete factors that can be reported every month. The second step is to give weighting to every need in the scorecards. The third step is to provide the basis and purpose of each criterion. The fourth step is to add an interval for each sub-goal on the scorecard that will show the developmental stages of the goal achievement process.

One of further development of BSC is the concept of strategy map based on BSC perspectives. The strategic map describes the goals of the organization and how the objectives can be achieved by involving the resources through the predetermined factors. In general, the strategy map shows the hierarchy of BSC perspectives in achieving company goals. Input of the strategy map is the components of corporate strategy that are aligned with the results of environmental analysis that includes internal and external analysis company.

The purpose of the research with the object of PT XYZ is (1) to identify the strengths, weaknesses, opportunities and threat of the company to assist in determining the strategy from each BSC perspective, (2) formulating an appropriate strategy map for the company by considering four BSC perspectives: financial, internal processes, customer satisfaction, and learning and growth, and (3) creating a performance appraisal plan taking into consideration the four BSC perspectives.

II. METHODOLOGY

This research is limited to PT XYZ organisation that is based in Indonesia and using company data of 2016. qualitative method used in environmental analysis process, development of strategy map and key performance indicator (KPI). Data sources are (1) primary data obtained from in-depth interview, and (2) secondary data obtained from literature study of journal, book, and latest company KPIs.

Sampling technique in conducting in-depth interview was done by purposive sampling technique. The selected respondents are key person or decision makers in PT XYZ who includes the president director, operational manager, human resources manager (HR), financial manager, safety manager and commercial manager. According to Jennings Jr (2010), based on the experiences of BSC user organizations, the success of the strategic planning system depends on the support of decision makers within the organization.

Data Processing and Analysis

Environmental analysis carried out by SWOT or TOWS method in accordance with the concept provided by Wheelen and Hunger (2012). This analysis includes EFAS (External Factor Analysis Summary) by determining Opportunity and Threat. This analysis also includes IFAS (Internal Factor Analysis Summary) by determining the Strength and Weakness of the company. From the two types of analysis are then sorted so that obtained strategic factors which are then analyzed by TOWS matrix.

Factor determination, score score and weighting were done by In-depth Interview method. This method is also done to determine the objectives and KPI from each BSC perspective. The targets that have been applied today will be analyzed and classified in each perspective and then integrated in to new performance appraisal system.

Framework

The framework of research is described in Figure 1. The research process will start from a re-understanding of the company's vision and mission. This is followed by environmental scanning by analyzing external factors in the form of opportunities and threats, and internal factors in the form of strengths and weaknesses. The results of the assessment of both factors will be used to analyze the strategy set by the company at this time. The results of the analysis are then formulated into a strategy map based on BSC perspectives.

The study continued with the preparation of KPI based on the strategy map and considering the activities that have been done by the company at this time. The KPIs are then classified based on the four BSC perspectives namely financial, customer, business / internal process, and learning and growth. KPIs from each perspective are then assessed on the basis of their relevance to the company strategy set forth in the strategy map. From this process KPI improvements will be generated or addition and subtraction of KPIs to stay in line with the strategy map. The next process is weighting each perspective and KPIs. The last stage is the preparation of strategic initiatives that will support the process of achieving company goals by using a new performance appraisal system that has been made.
III. RESULTS

Translation of Company Vision, Mission and Strategy

This research begins with a discussion of the strategic components of the company conducted with the respondents who are the decision makers in the company. These strategic components include the company's vision, values, strategy and organizational structure. PT XYZ Company adopts all the strategic components of its parent company which is one of the company's main strategies to unite the vision of all members of the global organization so that it will assist in internal coordination of the company.

Respondents are asked to provide an opinion on the strategic component whether it is acceptable and approved by all members of the company. In-depth interviews are also conducted to understand whether each strategic component is aligned with the company's current operational activities. This interview also discusses the description of resources that have been owned and will be needed by the company to achieve the company vision.

Environmental analysis of The Company

The process of environmental analysis is done by involving the respondents with the aim to understand the main factors that affect the company from all aspects of the company. This process starts from the identification of corporate factors which are then grouped into threats, opportunities, weaknesses and strengths. By doing pairwise comparison it will get the main factors with the highest weight.

From the analysis of external factors, the main threats of the company are (1) global economic growth that tends to slow down in impact to mining industry, (2) Indonesian government policy in limiting the production and distribution of explosives for state security reasons, (3) existing competitors, (4) import limitation by government and (5) substitution products in the form of mining technology without blasting.

Opportunities owned by the company include (1) the need for new technologies in the mining sector, (2) government support to the mining sector, (3) re-operation of old mines, (4) the need for effective and efficient mining operations.
From the internal analysis, it is found that the weaknesses of the company are (1) the ability of the market intelligence is less sharp, (2) lack of quantity of trained labor owned by the company, (3) lack of understanding of the parent company about the business culture in Indonesia, (4) brand Image as a product with a high price and (5) intervention of the holding company that inhibits the creativity of PT XYZ.

The strengths of the company include (1) the superior quality of technical personnel, (2) brand Image as a good quality product, (3) excellence in electronic blasting technology, (4) the contract agreement that has been established with large mines in the country, (5) company experience in supply chain of explosives in the country, (6) position as market leader and (7) good financial condition.

**Strategy Map of the company**

A strategy map is created by determining the goals to be achieved within each perspective and then formulating the activities undertaken to achieve those goals. Each activity is linked to a chain of causal relationships and by following the path to the company's goal. As a profit company then the ultimate goal of the company is profit from the financial side.

According to Kaplan and Norton (2004), the Strategy map is based on several principles (1) the strategy must balance the opposing interests, (2) the strategy is based on the value proposition for each customer, (3) value is created through the business process internally, (4) the strategy consists of themes that work simultaneously and complement each other, (5) strategies to determine the value of the intangible assets for the company. From the results of the assessment conducted then obtained strategy map for PT XYZ as shown below.

![Strategy Map of PT XYZ](image)

**Gambar 2. Strategy map of PT XYZ**

PTXYZ Strategy map is described in Figure 2. Each element of the strategy in each perspective is then spelled out by defining the target, lead indicator and each indicator's lag. According to McChesney et al (2012), lag indicator is a parameter that measures the level of goal achievement. Lead indicators are parameters used to measure results. Lead indicator has two main characteristics (1) Predictive, meaning that if the lead measure is changed then the lag measure will also change, (2) Can be influenced directly by the team. Lead indicator serves to be a leverage to lag indicator achievement or a tool to lift the load achievement lag indicator.

**The New PT XYZ Performance Appraisal Design**

Strategy map becomes a reference in making performance appraisal design where KPIs are developed based on lag indicator and target of each strategy. To facilitate understanding for members of the organization, KPI-KPI is classified based on BSC perspectives.
Each KPI will be equipped with targets tailored to the company's business objectives within the scoring period, for example the annual KPI will follow the company's goals within the one-year period. Business goals are usually based on the company's vision and strategy and take into account the company's internal conditions such as availability of resources. The targets are also made by considering the prediction of market conditions and macroeconomic factors such as government policies related to the business undertaken.

Each KPI is also equipped with weights in accordance with the company's assessment of the distribution of KPI to the process of achieving company goals. This weighting will also determine the final assessment of the firm's performance as an indicator of corporate success. Most companies integrate this weighting with the bonus calculation system and employee incentives so that every employee will pay attention to the work focus that must be completed and can make the priority scale for his work activities. The design of this performance appraisal system uses 100% scale, meaning that the achievement value below 100% is considered not to meet the target while the value of more than 100% is considered to exceed the target. The final appraisal is conducted annually however mid year review is required to optimize the final year results.

The appraisal systems materials including the KPI, target and weight need to review annually to accommodate changes of external and internal factors. The appraisal systems is based on current PT XYZ vision and strategy, this will need to review when the company managed to revise or establish new strategies or company values.

<table>
<thead>
<tr>
<th>No</th>
<th>KPI</th>
<th>Target</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Increasing company revenue</td>
<td>- Sales (revenue) achievement</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- EBIT achievement</td>
<td>25%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Cash Collection</td>
<td>25%</td>
</tr>
<tr>
<td>2</td>
<td>Improving company cost efficiency</td>
<td>- Fixed cost saving</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Operating cost saving</td>
<td>10%</td>
</tr>
<tr>
<td>3</td>
<td>Increasing asset utility</td>
<td>- Forecast accuracy</td>
<td>5%</td>
</tr>
</tbody>
</table>

The focus of the financial perspective shown in Table 1 is on increasing revenues, decreasing costs and increasing utility assets. Targets for corporate earnings include increasing the value of sales/revenue to customers which is one indicator of the company's business growth and increasing the value of profit margins. The company must also take into account the realization of revenue by ensuring payment from customers is done in a timely manner.

The company need to target cost efficiency by reducing the fixed costs and operational costs of all departments and all activities undertaken. Cost efficiency is also done by applying the planning/forecasting as accurately as possible so as to improve the efficiency of the production process, purchasing and storage of goods. Accurate sales forecasts can result from in-depth study of customer conditions and general market conditions.

<table>
<thead>
<tr>
<th>No</th>
<th>KPI</th>
<th>Target</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Increasing market share</td>
<td>- Customer retention</td>
<td>12%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Addition of new customers</td>
<td>20%</td>
</tr>
<tr>
<td>2</td>
<td>Increasing customer satisfaction</td>
<td>- Customer satisfaction survey results</td>
<td>9%</td>
</tr>
<tr>
<td>3</td>
<td>Improving Product Differentiation</td>
<td>- Value of new products (differentiated products) sales</td>
<td>9%</td>
</tr>
</tbody>
</table>

Customer perspective as shown in table 2 has the biggest weight considering the business competition is quite tight so it takes strategic optimum efforts to maintain market share. In practice, market share changes can occur rapidly as a result of changes in customer business conditions due to financial, operational or social issues can lead to a decrease in business volume of customers. The raise and fall of explosives market share is influenced by number of customers that is relatively few and each has a large volume of business.

The customer perspective also represents an external factor of potential changes in government regulations in terms of mining and explosive business. Government regulation is one of the main factors determining the up and down of explosives business. The laws governing this business cover the areas of production, marketing and supply chain and involve several parties such as the police, the state intelligence agency and the trade ministry. Issues of explosive abuses that affect the safety and security of the state led the government to set strict regulations with very minimal tolerance. Failure of the company to comply with the regulation can lead to significant sanctions for the company's business.

The implications of this perspective require companies to develop comprehensive and structured intelligence market strategies. The intelligence process is not only targeted to customers but also the regulators of the central government and local governments, this is to see the potential changes in regulations that may affect
the company's business. The data from the market is then used as the basis for the marketing strategy by considering the condition of the mining business in the short term and the prediction of long-term conditions. The marketing strategy should also take into consideration the political and economic conditions in Indonesia which have the potential to lead to regulatory changes that directly or indirectly affect the mining business and explosive business.

Customer perspective KPIs also have a target to improve the quality of service to customers in accordance with the values required by customers, this is assessed by customer satisfaction survey. The KPI also aims to increase the company's marketing coverage in capturing new customer opportunities. To reinforce the values offered to customers, product and service differentiation is made to the customer so that it can cover as much as possible the needs of the customers.

<table>
<thead>
<tr>
<th>No</th>
<th>KPI</th>
<th>Target</th>
<th>Weight</th>
</tr>
</thead>
</table>
| 1  | Effective and efficient supply chain process improvement | - DIFOT (Delivery In Full On Time) assessment  
- Customer survey results on DIFOT | 6.25% |
| 2  | Increasing internal initiatives on company improvement | - Breakaway target achievement | 5% |
| 3  | Improving SHES (Safety Health Environmental and Security) performance | - Critical Risk Assessment (CRA) target achievement  
- SHES incident target achievement | 10% |
| 4  | Improving the development of new technology | - Achievement of target of new technology application at customer site | 3.75% |

The internal perspective KPI shown in table 3 aims to strengthen the system owned by the company so that it can improve products and services as per each customer values and deliver the company value to the customers. Safety, health, environmental and security (SHES) factors in the production process and value transfer to customers are fundamental to be met not only before the operational process is carried out but also during the process.

The development of initiatives for the development of internal systems must be done systemically and well controlled so that the company can assess its success rate. The program used by PT XYZ is Breakaway program that is adopted from a consulting services company. A similar program can be developed from the internal company and can be done at no cost to the consultant. The advantage of using external consultants is objective assessment by the third party and value benchmarking against other consultants' customers.

<table>
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<tr>
<th>No</th>
<th>KPI</th>
<th>Target</th>
<th>Weight</th>
</tr>
</thead>
</table>
| 1  | Improving training quality | - Mandatory training compliance achievement  
- Specific training compliance achievement  
- Trainee satisfaction survey results | 8% |
| 2  | Increasing employee satisfaction to the company | - Employee turn-over rate  
- Organisation Health Index (OHI) survey results | 10% |
| 3  | Improving Information Technology (IT) services | - Employee satisfaction to IT process survey results | 2% |

The KPIs of perspective of growth and learning as shown in Table 4 aims to create the basis for all processes that run within the company. The KPIs aims to empower all resources within the company, which includes human capital, information capital and organizational capital optimally, and continuously develops the resources. Human capital is considered as the main capital of the company and developed through a systematic and planned training process. The highly regulated explosives business require human resources with high technical competency and high ability to pass through regulatory constraints in any company activity.

PT XYZ adopts the Organizational Health Index (OHI) assessment system from McKinsey consultant services to assess the company's ability to meet challenges and conduct changes effectively and grow internally from the organization. OHI assists the company in assessing the quality of the organizational capital and determines the subsequent mining measures.

KPIs that has been compiled is an indicator at the level of the company, to lower it to the department level and other levels under it then need to do value chain analysis to determine the functions and tasks of each department. A solid and comprehensive performance appraisal model supported by a company-level strategy map will simplify the process of cascading the model down to the bottom without losing company strategy.
Implementing a good performance appraisal system requires (a) clear and consistent top management support, (b) the establishment of measurable goals and objectives, and (c) timely application and reinforcement at every managerial level (Hall et al., 1989).

### Strategic Initiatives

Strategic initiatives are formulated by looking at performance appraisal systems, strategy maps, and environmental analysis results. The strategic initiatives for PT XYZ to compete in the highly regulated explosives business include:

1. Strengthen market intelligence strategies to help market penetration and anticipate changes.
2. Increase product differentiation to strengthen value selling to customers.
3. The development process of internal initiatives should be improved and followed up systematically to obtain optimal results.
4. Implement training programs and development of technical experts blasting structured in order to obtain quality and loyal resources.

### IV. Conclusion

The customer perspective is a top priority in explosives business that is limited by strict regulations in almost all countries and especially in Indonesia. Market share is crucial because it determines the volume of a company's business. This type of business should also allow for significant and sudden changes resulting from unilaterally changing government regulations. Communication with customers and understanding of the market situation is key to winning the competition for explosives business market share.

BSC-based KPI structure makes it easier for companies to classify the achievement of indicators from each perspective so that they can be analyzed comprehensively and partially. BSC can assist the company in running the strategy by sticking to the vision and strategy of the company. The relationship between strategy map and performance appraisal will facilitate the follow-up of assessment results from each KPI as it is structured in the strategy map. Further research is needed to obtain a complete solution in improving the company's ability to run a business in highly regulated business.

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Exploring the Use of Kenyan Diatomite As A Source Of Refractory Materials

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Abstract

The history of the developed and newly developed economies of the world shows that the establishment of material processing industries has had the greatest contribution to the growth of their national wealth. Refractories are essential for all industrial processes using elevated temperatures. The ability to withstand exposure to heat above 538 °C is the critical distinction separating refractory from other ceramics. The aim of this study therefore, is to find out the possibility of using Diatomite, mined in Kenya, as a major raw material in the production of refractory linings. Diatomite has been utilized in Kenya but majorly in the manufacture of products like industrial filters and fillers for local consumption and export. Diatomite were collected from Gilgil near Lake Elementaita, crushed, sieved and the chemical composition determined. The samples were moulded into rectangular shaped bricks of 40mm height, 40mm width and 80mm length, allowed to dry and later fired up to a temperature of 1000 °C. Refractory properties like Compressive strength, Hardness, Linear shrinkage on firing, Apparent porosity and Density were determined. The result of chemical analysis indicated that the clay was composed of Silica (SiO₂), 74.8%; Alumina (Al₂O₃), 3.26%; Iron Oxide (Fe₂O₃), 2.19%; Calcium Oxide (CaO), 1.82%; Potassium Oxide (K₂O), 0.64%; Sodium Oxide (Na₂O), 2.77%; and other traces. The physical and mechanical tests show that the clay had Cold Crushing Strength of 1357kPa, Hardness of 10.03GPa%, Linear shrinkage of 11.17%, Apparent Porosity of 64.55% and Bulk Density of 0.81g/cm³. Diatomite can make better local refractory raw materials.

Keywords: Refractory, Diatomite, cold crushing strength, hardness, density, porosity, shrinkage
1.0 INTRODUCTION

Any material can be described as a ‘refractory’, if it can withstand the action of abrasive or corrosive solids, liquids or gases at high temperatures. Refractory materials are used in linings for furnaces, kilns, incinerators and reactors. Depending on the operating environment, they need to be resistant to thermal shock and have specific ranges of thermal conductivity and coefficient of thermal expansion. The ability to withstand exposure to heat above 538 °C is the critical distinction separating refractory from other ceramics, fibres and coating applications at only lower temperature [1].

[2], reported in his work on refractory properties of termite hills under varied proportions of additives that over 80% of the total refractory materials are being consumed by the metallurgical industries for the construction and maintenance of furnaces, Kilns, Reactor Vessels and Boilers. The remaining 20% are being used in the non-metallurgical industries as cement, glass and hard ware.

The basic functions of refractory materials are given below [3];

1. To ensure the physical safety of personnel and installations between the hot material (the processed product) and the outer shell of the processing tool
2. To reduce heat loss.

Most refractory materials are made from naturally occurring high melting point oxides. They include silica (SiO₂), Alumina (Al₂O₃), Magnesia (MgO), Chromium oxide (Cr₂O₃), Zirconia (ZrO) and iron oxide (Fe₂O₃). They are either used in natural form without any formal processing or in roasted condition [4].

It is unfortunate that despite vast clay deposits in Kenya, the Country’s metallurgical industries still depend on imported refractories to meet local consumption and as a result, a lot of hard earned foreign currencies are spent in the process. [5], mentioned that the ceramic industry is basic to the successful operation of other industries and their properties are also critical for many applications.

The aim of this study is to research on the production of high temperature refractories from local materials. This research focuses on the use of Kenyan diatomite for the manufacture of refractory materials. High quality refractory at a cheaper cost is the main requirement because cost of refractory adds into the cost of products.

Diatomite also known as Diatomaceous earth is a naturally occurring, soft, siliceous sedimentary rock that is easily crumbled into a fine white powder. The powder has an abrasive feel similar to pumice powder, and is very light due to its porosity. Diatomite is a highly porous material that exhibits high absorption capabilities and has a good chemical inertness. Major applications are filtering aids, metal polishing, thermal insulation, and Portland cement [6].

Diatomite in its natural state is a soft rocklike material consisting of the skeletal remains of a variety of single celled microscopic plants known as diatoms. They are generally amorphous, hydrated or opaline silica, SiO₂_x.n. H₂O, with various amounts of impurities such as silica sand, clay minerals, metal salts and organic matter. Because of these contaminants, silica content may range from 58 to 90% of the dry product [7].

Since its establishment in 1942, Africa Diatomite Industries Limited (ADIL) has been exploiting diatomite in Gilgil, a town north west of Nairobi (Kenya), for export. ADIL has access to good quality diatomite deposits estimated at over 6 million tons and currently boasts having the only known viable quality deposits of Diatomite in Kenya [8].
In addition to diatomite deposits in Gilgil, the mineral has also been discovered in Baringo. Currently, according to [9], diatomite mining in the area is carried out by artisans in an open-cast method. The amount is yet to be quantified but it is estimated to be of substantial quantity. [9] also reports that, a Chinese company holding 202 square kilometers-rich in diatomite and non-metallic gem minerals in Baringo is looking to setting up a KSh200 million diatomite mine. According to [10], the Physical properties of the diatom and of processed diatomite that provide unique commercial value in a broad spectrum of market end users include ornate fine structure, low bulk density, high porosity, and high surface area. Properties of equal importance are mild abrasiveness, high absorptive capacity, insulating ability, relative inertness, high silica content and high brightness. Processed diatomite possesses an unusual particulate structure and chemical stability that lends itself to applications not filled by any other form of silica. Foremost among these applications is its use as a filter aid, which accounts for over half of its current consumption. Its unique diatom structure, low bulk density, high absorptive capacity, high surface area and relatively low abrasion are attributes responsible for its utility as a functional filler and as an extender in paint, It is actively exploited and used as raw material for filtration of fluids, pesticides, thermal treatment, paper and rubber filling and natural water purification [7].

2.0 THE OBJECTIVES OF THE RESEARCH
General Objective
To investigate the potential of Kenyan diatomite for use in the production refractories.
Specific Objectives
1. To carry out chemical analysis of the clay under study.
2. To prepare brick samples out of the diatomaceous earth.
3. To determine the physical and mechanical properties of the prepared samples.

3.0 MATERIALS AND METHODS
3.1 Raw material and Sample Preparation
The production of refractories begins with processing of raw materials. Raw material processing involves drying, crushing and grinding and determination of the Chemical Composition. The raw materials (clays) were initially air dried and then later oven dried at 105\(^0\)C to ensure that all the moisture had been removed. The raw materials were then crushed using a pestle and mortar until a suitable ratio for coarse particles to fine particles was achieved.

The chemical composition of the raw clay sample in percentage weight (wt %) of (\(\text{SiO}_2, \text{Al}_2\text{O}_3, \text{Fe}_2\text{O}_3\),etc) was examined using Atomic Absorption Spectrophotometer (AAS), which was carried out at Ministry of Mining Research Laboratories Center, Nairobi, Kenya.

3.2 Development of the refractory from the raw materials
This involved the actual production of refractory from the collected raw materials to the final shaped (formed) product.

1. Mixing
The ground particles were thoroughly mixed. This was done for two purposes;
   i) For even distribution of the coarse and fine particles
   ii) For making moulding easy

2. Moulding
The brick samples were formed into the required shape and size with the aid of a wooden box type of mold which could produce three samples at one go. The test pieces of the refractory materials were made into rectangular shapes of dimensions 80 x 40 x 40 mm in a mold and compacted under a hydraulic pressure of 350kN/m². 350kN/m² was determined as the optimum hydraulic pressure necessary from the work of [11].

3. Drying
The molded refractory was dried to remove its moisture. This was carried out very slowly and under particular set of conditions of humidity and temperature. The sample bricks were air dried until when they were physically seen to be dry. From the drying floor the samples were then put in an oven operating at 105°C for twelve hours to remove all the remaining moisture.

4. Firing
The dried refractory was burnt for vitrification and development of stable mineral forms. In this step the already dried bricks were passed through a furnace at a controlled temperature over a certain fixed duration. The samples were fired at a temperature of 1000°C. At this temperature, the soaking time was six hours (6hrs). This is according to [12].

3.3 Testing of the brick samples to establish their stability characteristic properties.

3.3.1 Apparent porosity Test
Porosity of a material is defined as the ratio of its pores volume to the bulk volume. Thus porosity is an important property of refractories because it affects several other characteristics like strength, abrasion resistance, thermal conductivity and chemical stability. Porosity decreases the strength, thermal conductivity, resistance to abrasion and resistance to corrosion. On the other hand, it increases the penetration of slags, molten charge and/or gases into the refractory material and resistance to thermal spalling (thermal shock resistance). Therefore, in general, a good refractory should have lower porosity.

The apparent porosity, sometimes referred to as open porosity, is a measure of the open or interconnected pores in a refractory. The apparent porosity is determined by the volume of liquid which was absorbed by the pores when the specimen is boiled in vacuum conditions, and when the material is saturated in water.

According to [13], the porosity of a refractory has an effect upon its ability to resist penetration by metals, slags and fluxes and, in general, the higher the porosity, the greater the insulating effect of the refractory.
[14], also states that porosity and pore size distribution of a refractory will influence its thermal conductivity, in that, more porous refractory translates to a more insulating refractory.

This experiment was performed according to [15], whereby dry specimens were put in an oven maintained at a temperature of 110°C till it attained a substantially constant mass (with an accuracy of 0.01 grams). The weight of the specimen ($W_1$) was recorded after cooling it to room temperature. The dry specimens were then immersed completely in water at atmospheric temperature for 24 hours. The specimens were taken out of water and wiped out with a cloth before being weight. The weight after removal from water was let to be, $W_2$.

The respective dimensions of the samples were measured using a vernier caliper. The dimensions were then used to calculate the sample volume ($V$).

The apparent porosity per cent, after 24 hours immersion in cold water is given by the relation;

$$\text{Apparent porosity, } P_A = \frac{W_2 - W_1}{V} \times 100$$

Where: $W_1$ and $W_2$ is the weight of the absolutely dry specimen and the weight of the same specimen saturated in water [g], and $V$ is the volume of the specimen [cm$^3$] [16]

$$\text{Volume}=\text{length} \times \text{width} \times \text{height}$$

3.3.2 Bulk density

The bulk density (BD) is the amount of refractory material within a volume (kg/m$^3$). An increase in bulk density of a given refractory increases its volume stability, heat capacity and resistance to slag penetration. Bulk density is the ratio weight or mass to volume and it is expressed in pounds per cubic foot or kilograms per cubic meter [17].

[13], also defines bulk density as a measure of the ratio of the weight of a refractory to the volume it occupies.

According to [14] report, the simplest way of measuring Bulk Density for uniform rectangular refractory shapes is by dividing Dry Weight by Bulk Volume which is calculated from measured dimensions. Density, porosity and permeability measurements show whether a body is fully dense, and whether therefore it can be expected to stand up to aggressive slag attack and/or penetration by process gases.

The air dried specimens were further oven dried at 110 °C, cooled and weighed to the accuracy of 0.01 in order to determine their dried weight (DW). The respective dimensions of the samples were measured using a vernier caliper. The dimensions were then used to calculate the sample volume ($V$).

The bulk density was calculated from the equation proposed by [18].

$$\text{Bulk density, } BD = \frac{DW}{V} \text{ g/cm}^3$$

Where, $DW$ = Dried Weight $V$ = Volume

$$\text{Volume}=\text{length} \times \text{width} \times \text{height}$$

3.3.3 Cold crushing strength
Cold crushing strength is the resistance of the refractory to compressive loads. As per [19], a cold crushing strength test is used to measure the cold strength of a brick. It is used to show whether or not the brick has been properly fired. This test, generally a quality control check, also indicates whether the brick will damage to corners and edges in transport. Cold crushing strength is the maximum load at failure per unit of cross-sectional area when compressed at ambient temperature.

The dried test bricks produced from the anthill clay, were oven dried at a temperature of 110 °C for 12 hours. It was then cooled to room temperature. The specimen was then taken to the compressing test machine where load was applied until cracks were noticed. The load at which the specimen cracked was noted, which represents the load required for determining cold crushing strength of the test specimen. The test was carried out in accordance with [20]. Cold Crushing Strength was then calculated using Equation;

\[
\text{CCS} = \frac{\text{Maximum load (kN)}}{\text{Cross-sectional area (m}^2\text{)}} = \frac{P}{A}
\]

Where, CCS = Cold Crushing Strength P = Applied Load A = Area of Load Applied
A good refractory material must possess high mechanical strength to bear the maximum possible load without breaking.

3.3.4 Linear shrinkage

Linear shrinkage represents the permanent change that the refractory shapes undergo on heating or after reheating under a given set of conditions. The drying of clay is always accompanied by shrinkage. As the film of water between the clay particles is drawn off by evaporation the particles draw closer together to close up the interstices. The effect of this action is the shrinkage of the entire mass of clay.

To determine the fitness of a particular brick for service, it is often tested for shrinkage under temperature conditions equivalent to those which it would receive in use. This is done by first determining the length or volume of the brick by measurement and then subjecting it to a prolonged heating at the desired temperature. After the brick has cooled, it is again measured and the length, volume and shrinkage determined.

A slanted line of length 6cm was inserted horizontally on each piece and recorded as \(L_1\). The test pieces were then placed inside the furnace and fired up to 1000°C and the line drawn across the horizontal axis of the pieces was measured to determine its final length \(L_2\) after firing. The linear shrinkage of the materials was determined with equation;

\[
\text{Linear shrinkage (\%)}, = \frac{L_1 - L_2}{L_1} \times 100
\]

The test was carried out in accordance with [21].

3.3.5 Hardness test
Hardness is a characteristic of a material, which can be defined as the resistance to indentation, and it is determined by measuring the permanent depth of the indentation. Measuring the hardness of a ceramic is important and this is usually done using an indentation test. The basic idea is that a permanent surface impression is formed in the material by an indenter. The actual or projected area of the impression is then measured. The hardness is then determined by dividing the applied force, \( F \), by this area [22].

In this study, hardness will be determined using the Brinell method. The Brinell method applies a predetermined test load (\( F \)) to a carbide ball of fixed diameter (\( D \)) which is held for a predetermined time period and then removed. The resulting impression is measured across at least two diameters – usually at right angles to each other and these result averaged (\( d \)).

In this experiment, the indenter diameter (\( D \)) used was 5mm and the test force (\( F \)) was 1kN. Typically, an indentation is made with a Brinell hardness testing machine and then measured for indentation diameter in a second step with a specially designed Brinell microscope or optical system. The resulting measurement is converted to a Brinell value using the Brinell formula or a conversion chart based on the formula.

Equation below illustrates the formula used to obtain the Brinell value.

\[
HB = \frac{0.102F}{0.5\pi(D - \sqrt{D^2 - d^2})} \text{ N/m}^2
\]

Where \( F \) = Force, \( D \)=Ball Diameter, \( d \) = diameter of indentation.

at a constant force of 1kN, and a ball diameter of 5mm

4.0 RESULTS AND DISCUSSION

The results from the experimental work are given in tables 1 and 2. From table 1, it is evident that diatomite clay has silica as the predominant substance and it could be concluded that it is siliceous in nature.

The sample has high silica content well above the ideal 46.51% for clay which makes it be able to withstand fairly high temperatures [23]. From [24] report, the silica content of diatomite satisfies the standards for the manufacture of high melting clay.

The sample clay has a fairly high iron content (\( \text{Fe}_2\text{O}_3 \)) which makes it fire terracotta red (brick red) color on firing [11].

The Loss on Ignition of the diatomite clay (LOI) was determined as the percentage of moisture loss to ignition on firing. This represents the amount of moisture the clay material could hold or percentage weight reduction of the soil sample which may probably be a reflection of its grain structure and fineness. Following the report by [24], the loss on ignition of the sample falls within the standard range for the production of ceramics, refractory bricks and high melting clay. [25], suggests that the loss on ignition values, are required to be low in order to reduce on the effect of porosity on the final products.

Table 1: Chemical composition analyses of Anthill clay compared with standard clay for industrial applications [24].
The physical test results of diatomite clay showed an apparent porosity of 64.5% which according to [26], qualify to be used as insulating firebricks. The samples with the values ranging between 40-70%, are likely to be poor heat conductors, and of low strength. They can be used for insulating purposes. The low strength can be improved upon by increasing the firing intensity.

The bulk density of 0.8 g/cm³ was obtained which according to [27] makes them qualify to be used as insulating refractories.

The Cold crushing strength of the diatomite bricks obtained was 1357 Kpa. This value falls within the standard range for the manufacture of thermal insulators as given by [28]. According to Kumar, the standard range is 981-6867kPa.

According to [25], the total percentage shrinkage for standard fireclay and siliceous refractories are supposed to be ranging between 4-10%. The total percentage shrinkage value obtained from the brick samples was 11% which fall slightly above the acceptable range.

The hardness value obtained from the fired diatomite bricks was 10.03GPa which falls between the highest and least hardness values for ceramics as given by [22]. It is reported that MgO has the least hardness value of 3.63GPa while Diamond is the hardest with a value of 78.48 GPa.
Table 2: Physical and Mechanical test results

<table>
<thead>
<tr>
<th>Sample description</th>
<th>Test properties</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Apparent Porosity (%)</td>
</tr>
<tr>
<td></td>
<td>Bulk Density (g/cm³)</td>
</tr>
<tr>
<td></td>
<td>Cold Crushing Strength (kPa)</td>
</tr>
<tr>
<td></td>
<td>Linear Shrinkage (%)</td>
</tr>
<tr>
<td></td>
<td>Hardness (GPa)</td>
</tr>
<tr>
<td>Anthill Brick</td>
<td>64.5</td>
</tr>
<tr>
<td></td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>1357</td>
</tr>
<tr>
<td></td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>10.03</td>
</tr>
</tbody>
</table>

5.0 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

An experimental study was conducted to investigate the suitability of diatomaceous earth as industrial raw material for making refractories in view of their chemical, mechanical and physical properties. The results of the chemical analysis showed that the clay contain silica (SiO₂) as major constituent making it suitable as siliceous refractory material.

The batch samples passed through the experimental tests to determine their refractory properties in terms of mechanical and physical behaviors showed that the selected raw material (clay) can substitute for the imported refractories as thermal insulators. The cost of refractories will also reduce since they can be obtained locally. The chemical composition results also suggested that the clay is found to be a source of local raw materials for the production of thermal insulators. The results of the investigation will be very useful and serve as a database for prospective investors and managers of metallurgical industries. It can therefore be concluded that diatomite can substitute for the imported refractory raw materials.

5.2 Recommendation

The clay under study, that is, diatomite, has not been exploited in Kenya for the production of refractories. Thus if this clay is exploited and harnessed, it will no doubt provide an internal source of raw materials. There is also the need for geological survey to determine the extent of the deposits.

REFERENCES


Analysis of variation of Cutting Forces With Respect to Rake and Shear Angle

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Mechanical Engineering, MUFFAKHAM JHA COLLEGE OF ENGINEERING AND TECHNOLOGY, HYDERABAD

Abstract – Metal machining process is one of the fundamental areas where manufacturing industry prospers. The major parameters that control the quality of the job within the tolerance limits are speed, feed and depth of cut and other process parameters that affect the machining. In this paper an effort has been made to study the effect of rake angle on cutting forces for a single point cutting tool. Different experiments are carried out to identify the variation in cutting force with the variation in rake angle.

Keywords: Rake Angle, cutting forces, dynamometer, merchants circle analysis, Profile projector

I. INTRODUCTION

The modern world demands high productivity to meet the ever growing demand, an increase in productivity requires involvement of all production operations, activation of all the available manufacturing facilities. In order to involve all the technological operations, optimum technological processes, optimum tool selection, suitable combination of tool-workpiece material and determination of optimum cutting variables and tool geometry must be considered. The tool geometry has an important factor on cutting forces and cutting forces are essential sources of information about productive machining. … [1]

The amplitude and frequency of cutting forces and torque are used in calculating the required power as well optimal planning of individual machining operations based on physical constraints. During cutting process, the cutting tool penetrates into the workpiece due to the relative motion between tool and workpiece. The cutting forces are measured by the dynamometers designed for different working principles on a measuring plane in the Cartesian coordinate system.

In this study, the influence of rake angle and shear angle on the cutting force is investigated. The experiments are carried out on a lathe and cutting force components are measured in the process using a dynamometer.

A. Rake Angle

Rake Angle (α), the angle between the tool face and the plane normal to the surface of the cut through the tool cutting edge. Rake angle is a parameter used in various cutting and machining processes, describing the angle of the cutting face relative to the work. There are two rake angles, namely the back rake angle and side rake angle, both of which help to guide chip flow. Depending on the direction of the slope on the tool they are defined as positive, negative, and zero rake angles. … [1]

Generally positive rake angle makes the tool more sharp and pointed. On the other hand it reduces the strength of the tool, as the small included angle in the tip may cause it to chip away. It also reduces cutting forces and power requirements. Positive rake angle helps in the formation of continuous chips in ductile materials and also help in eliminating the formation of a built-up edge. … [1]

Negative rake angle, by contrast make the tool blunter, increasing the strength of the cutting edge but also increases the cutting forces. Though it increases friction,
resulting in higher temperatures yet it improves the surface finish. … [1]

A zero rake angle tool is the easiest to manufacture, but has tendency to a larger crater wear when compared to positive rake angle as the chip slides over the rake face. Recommended rake angles can vary depending on the material being cut, tool material, depth of cut, cutting speed, machine, and setup. Rake angles for drilling, milling, or sawing are often different. … [1]

B. Cutting Force Components:

In orthogonal cutting, the total cutting force (Fc) is conveniently resolved into two components in the horizontal and vertical direction, which can be directly measured using a force measuring device called a dynamometer. Also a small radial force will generate in z-direction which are shown in figure (3). … [1]

II. WORK MATERIAL, CUTTING TOOL and METHOD:

AISI 1018 steel has been used as the work piece material to conduct all the experiments. These type of materials are extensively used in the industrial applications. Samples were prepared from cylindrical bar with diameter of 25mm, prior to the experiments the specimens were turned with 1 mm cutting depth in order to remove the outer layer, which could appear discontinuous or unexpected hardening distribution due to their extrusion production process. The chemical composition and mechanical properties of the selected work piece material are listed in table (1)

<table>
<thead>
<tr>
<th>Table (1): Main Composition of AISI 1018 steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon</td>
</tr>
<tr>
<td>Silicon</td>
</tr>
<tr>
<td>Manganese</td>
</tr>
<tr>
<td>Phosphorus</td>
</tr>
<tr>
<td>Sulphur</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table (2): Properties of AISI 1018 steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finish</td>
</tr>
<tr>
<td>Bright Drawn</td>
</tr>
<tr>
<td>Yield Strength (MPa)</td>
</tr>
<tr>
<td>340-600</td>
</tr>
<tr>
<td>Tensile Strength (MPa)</td>
</tr>
<tr>
<td>430-750</td>
</tr>
<tr>
<td>Elongation %</td>
</tr>
<tr>
<td>12 min</td>
</tr>
<tr>
<td>Hardness (HB)</td>
</tr>
<tr>
<td>120-220</td>
</tr>
</tbody>
</table>

Single point HSS (High speed steel) cutting tools were used in all the experiments. New tools were used for all experiments to ensure that tool condition is same in all the cases. Different rake angles were ground on each tool with the help of a tool cutter and grinder machine and the rake anglesis measured using profile projector as shown in figure (5).
Here the side rake angle, end cutting angle, side cutting angle, end clearance angle, side clearance angle are kept constant. The work piece for each experiment would have the same diameter (25mm) and a constant machining length. The experimental setup is shown in figure (6) and figure (7):

The various tool rake angles are: $0^\circ$, $5^\circ$, $10^\circ$, $17^\circ$, $18^\circ$, $20^\circ$, $25^\circ$ and a constant clearance angle was used. While turning a ductile material by a sharp tool, the continuous chip would flow over the tool’s rake surface and in the direction apparently perpendicular to the principal cutting edge. Practically, the chip may not flow along the orthogonal plane but this assumption is made for an ideal case.

The experiment were carried out by the use of lathe, dynamometer, and a couple of tools each having different rake angle ground on the rake face. The shear angle was estimated by keeping the depth of cut ($t$), feed ($f$), and speed (N in RPM) constant and subsequently measuring chip thickness ($t_c$). In order to measure the forces generated while machining, a dynamometer was used and the cutting force components were measured.
Table no. (3): Comparison of experimental and theoretical data

<table>
<thead>
<tr>
<th>SNo.</th>
<th>Rake angle (°)</th>
<th>Chip thickness (t)</th>
<th>Chip thickness ratio (r)</th>
<th>Shear angle (Φ)</th>
<th>Experimental cutting force (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0.74</td>
<td>0.6757</td>
<td>33.88</td>
<td>29.4 29.4 117.6 29.4</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>0.76</td>
<td>0.65</td>
<td>34.66</td>
<td>49.8 58.8 68.6 58.19</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>0.55</td>
<td>0.9</td>
<td>46.41</td>
<td>39.2 58.8 117.6 55.98</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>0.87</td>
<td>0.57</td>
<td>38.18</td>
<td>9.8 19.6 17.2 18.43</td>
</tr>
<tr>
<td>5</td>
<td>18</td>
<td>0.88</td>
<td>0.56</td>
<td>32.78</td>
<td>29.4 58.8 68.6 57.1</td>
</tr>
<tr>
<td>6</td>
<td>20</td>
<td>0.75</td>
<td>0.66</td>
<td>38.7</td>
<td>19.6 39.2 29.4 42.03</td>
</tr>
<tr>
<td>7</td>
<td>25</td>
<td>0.51</td>
<td>0.98</td>
<td>56.6</td>
<td>29.4 88.2 117.6 80.77</td>
</tr>
</tbody>
</table>

Here,

\[ \Phi = \tan^{-1}\left( \frac{r \cos \alpha}{1 - rsin \alpha} \right) \]

Where,

- \( r \) is chip thickness ratio and \( \alpha \) is rake angle

Variation of experimental cutting forces, \( F_y \) in particular with respect to rake angle is illustrated in the graph shown in figure (8);

![Figure (8): graph showing variation of cutting force (F_c) with respect to rake angle](image)

The theoretical approach to calculate cutting forces is given by merchant’s force analysis. Pictorially the merchant’s circle is shown in figure 9...

![Figure (9): Merchant’s circle for Force Cutting Analysis](image)

From the figure (8) it is evident that

\[ \frac{F_c}{\cos \left( \beta - \alpha \right)} = \frac{F_t}{\sin \left( \beta - \alpha \right)} \]

Therefore,

\[ F_c = F_t \cot(\beta - \alpha) \]
Using the above equation the theoretical cutting force is calculated and the corresponding values are tabulated in table no (3) above. A comparison between theoretical cutting force and experimental cutting force is shown in figure (9). Here the $\beta$ value is assumed to be $45^\circ$.

IV. CONCLUSION

The cutting forces are also calculated using merchant’s force analysis and the values were compared with experimental results. From the table and graph it is observed that the theoretical and experimental results are in good agreement with a standard deviation of 5-10%, which may be attributed to the inherent variability of parameters of machining, materials, vibrations, atmosphere, and operator’s skill etc.

Further a decreasing pattern of cutting force initially up to an angle of $18^\circ$ is observed, beyond which there is an increase in cutting force. This could be due to increase in vibrations of the tool as the tool nose becomes weaker due to increase in positive rake angle.

V. ACKNOWLEDGMENTS

We are thankful to the management of MUFFAKHAM JHA COLLEGE OF ENGINEERING AND TECHNOLOGY, Hyderabad and the technical staff for supporting this research work and preparation of specimens and testing etc.

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FINANCIAL PERFORMANCE ANALYSIS OF PRIVATE COMMERCIAL BANKS OF ETHIOPIA: CAMEL RATINGS

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Mr. MELAKU AWEKE
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ABSTRACT

This study sought to analyze the overall performance of private commercial banks in Ethiopia using CAMEL rating approach. In this study, the financial performance of six sampled private banks was measured using the audited financial reports of 10 years period (2007-2016). Novel feature of this study was the inclusion of more explanatory variables, which were not used by the average researchers i.e. fixed asset to total assets, net profit per employee, total deposit per no. branches, total loan per no. of branches, measurements. The collected data were analyzed using both descriptive and inferential statistical tools. The descriptive statistics tools used to rate the overall performance of the bank, while panel regression model was used to measure the impact of CAMEL elements on bank performance i.e. ROA and ROE. As per the composite rating of CAMEL, the finding of the study revealed that NIB bank stood on the top followed by United bank, while Awash bank and Bank of Abyssinia stood the least. On both panel model estimations, LEVRAGE, NIEGE, NPEP, TDBRA, TLBRA, NIITA, and LATD explanatory variables were significant in determining the profitability indicators-ROA and ROE. No asset quality indicators were significant in determining the profitability ratios.

Key words: CAMEL, ROA, ROE, Private Commercial Banks, and Ethiopia
1. INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Financial sectors play a crucial role in economic growth and industrialization via channeling funds from surplus units - the depositors, to the deficit units, the borrowers, in the process gaining from the spread of the different interest charged. Their intermediation role can be said to be a catalyst for economic growth (Funso, Kolade and Ojo, 2012). The role and importance of banks of modern economy is enormous (Bikker, 2010; Rashid, 2010; Altan, Beduk and Yusufazari, 2014) and its products/services which it provides growing in terms of depth, the number of institutions and the amount of money that managed by such institutions. The roles of such Banks are paramount in developing countries like Ethiopia where the financial market is underdeveloped and none existed.

The sector is the backbone of the economy in the country (Jain and Jaiswal, 2016). As the banks are interconnected with each other for the payment and other functions, the failure of a single bank not only affects its shareholders and depositors rather it affects all over the bank (Kumbirai and Webb, 2010) and it creates an economic turmoil situation which is regarded as a disaster for the economy that was viewed in recent global recession that occurred as the result of bank failure at the inception (Al Karim and Alam, 2013).

So, banks are exposed to many types of risk that has caused in different situations which result in different level of risks. Such risks include liquidity risk related to inability to meet current demand; credit risk is a default occurs when a borrower does not make the obligated interest and principal payments in a timely manner, interest rate risk (the possibility that the bank will become unprofitable, if rising interest rates force it to pay relatively more on its deposits than it receives on its loans). Zawadi (2013), Mohiuddin (2014) stated that Sound financial health of a bank is the guarantee not only to its depositors but is equally important for the shareholders, employees and whole economy as well. The subject of financial performance and research into its measurement is well advanced within finance and management fields (Alkhatib, 2012). As Searle (2008) stated the government of all nations should have maximum concern on performance of all banks which are operating in the territory of the country. In consideration of such outcome and concern, the financial health of each bank should have been measured from time to time and managed efficiently and effectively (Sangmi & Nazir, 2010).
There are different stakeholders that have interest in evaluations of the performance of banks including depositors, investors, bank managers and regulators (Ibrahim, 2014). For instance, central banks and bank regulators may need to identify and call attention to banks that are experiencing chronic financial problems in order that they may fix them before they get out of control. On the other hand, Shareholders need to assess which banks they can deem suitable for financially invest in. The banks evaluate their own performance over a given period so that they may determine the efficacy and long term viability of management decisions or goals so that they can alter the course and make changes whenever it is appropriate.

The stage of development of the banking industry is a good reflection of the development of the economy (Misra & Aspal, 2013). To sustain the development of the economy, the performance and health of banks has to be checked and evaluated periodically. There are different approaches used by different regulatory bodies. Among those approaches, most preferred parameters used by the regulators and different scholars are CAMEL (capital adequacy, asset quality, management quality, earnings and liquidity) rating criterion to assess and evaluate the performance and financial soundness of the activities of the bank. The CAMEL supervisory criterion in banking sector is a significant and considerable improvement over the earlier criterions in terms of frequency, check, spread over and concentration (Misra & Aspal, 2013; Basel, 2011). Hence, this study intends to analyze the performance of private commercial banks in Ethiopia by using CAMEL approach.

1.2 STATEMENT OF PROBLEM

The banking sector’s performance is perceived as the replica of economic activities of the economy. The stage of development of the banking industry is a good reflection of the development of the economy (Misra & Aspal, 2013). Evaluation of financial performance of the banking sector is an effective measure and indicator to check the soundness of economic activities of a nation.

The pioneer researches work by Anteneh, Arega and Yonas, (2011), evaluated the performance of selected commercial banks of Ethiopia using a framework of CAMEL for the period of 2000-2010. They found that independent variables in CAMEL framework have highly explained the performance variables i.e., return on assets and return on equity. The private banks were in a better position than the public banks in terms of asset quality, management quality, and earning
ability, while public banks were better in capital adequacy. However, liquidity position was high for both private and public commercial banks.

Mulualem (2015) on his evaluation of fourteen commercial banks using panel data and multiple regression for the period of 2010-2014 reveals that Capital adequacy, Asset Quality and Management efficiency have negative relation whereas earning and liquidity shows positive relationship with both profitability measures. The ranking result based Buna international bank ranked first by capital adequacy, asset quality and liquidity ratio while commercial bank ranked first by Management efficiency and Earning ratios respectively and finally Wegagen Bank was the first by the composite rate. However, the study conducted by Dakito (2015) using CAMEL approaches for the period 2000-2013 found that NIB’s overall performance was good.

On similar study by Ermias (2016) has also investigated the effects of internal determinants of profitability of six senior private Ethiopian commercial banks of the period 2000-2014 and thereby ranked the overall financial performance of the respective banks based on CAMEL model. He noted that bank specific factors incorporated into the CAMEL model affect to the extent of 67.5% of the changes in profitability of the private commercial banks of Ethiopia. On another study, Tesfaye (2014) examined the determinants of Ethiopian banks performance considering bank specific and external variables on selected banks’ profitability for the 1990-2012 periods. He found that bank specific variables by large explained the variation in profitability.

Gudata (2015) who measures the financial performance of five commercial banks of the period 2007-2011 using ratio analysis was found that Commercial Bank of Ethiopia stands first in assets management where as Awash International Bank took the first rank in terms of profitability performance. The Cooperative Bank pertains to stand last in terms of liquidity management and United Bank stood at the first rank in terms of solvency and risk management among all sample banks under study.

Although various studies were made to explain bank performance using CAMEL parameters, there are few studies were done in private commercial banks of Ethiopia. Besides, these studies were not exhaustive in applying the required explanatory variables to observe the bank performance. Similarly, most of the studies were conducted at different periods of time, used different methodology, and findings were varied: study between (Dakito (2015); Mulualem,
2015). Hence, the novel feature of this study was the inclusion of more explanatory variables, which were not used by the above posited researchers i.e. fixed asset to total assets, net profit per employee, total deposit per no. branches, total loan per no. of branches, measurements.

1.3 OBJECTIVES OF THE STUDY

1.3.1. GENERAL OBJECTIVE
The main objective of this study was to analyze the overall performance of private commercial banks of Ethiopian using CAMEL rating approaches

1.3.2 SPECIFIC OBJECTIVES

1. To check the capital adequacy level of private commercial banks
2. To evaluate the liquidity positions of private commercial banks
3. To measure the management capability of private commercial banks
4. To examine the earning quality of private commercial banks
5. To examine the asset quality of private commercial banks

1.4 LITERATURE DRIVEN HYPOTHESIS

H1: All else equal, there is no significant difference between capital adequacy ratios and performance of the banks

- H1a: The effect of TCTA on profitability is insignificant
- H1b: Leverage impacts bank profitability insignificantly

H2: All else equal, there is no significant difference between asset quality ratios and performance of banks

- H2a: The effect of FATA on profitability is insignificant
- H2b: Loan loss provision impacts bank profitability insignificantly

H3: All else equal, there is no significant difference between management quality ratios and performance of banks

- H3a: The effect of NIEGE on profitability is insignificant.
- H3b: NPEP impacts bank profitability insignificantly
- H3c: TDBRA impacts bank profitability insignificantly
- H3d: TLBRA impacts bank profitability insignificantly
H4: All else equal, there is no significant difference between earning quality ratios and performance of banks

- $H_{4_a}$: The effect of NIITA on profitability is insignificant.
- $H_{4_b}$: The effect of IITI on profitability is insignificant.

H5: All else equal, there is no significant difference between liquidity ratios and performance of banks

1.5 SCOPE OF THE STUDY

The scope of the study mainly delimited to six private commercial banks which includes Awash bank, Dashen bank, Wegagaen bank, NIB, Bank of Abyssinia, United bank. The time period for the study was bounded between 2007 and 2016.

The financial performance of the banks was measured using five elements of CAMEL, which were capital adequacy, Asset quality, management ability, earning quality and liquidity.

1.6 SIGNIFICANCE OF THE STUDY

The finding of study provides relevant information to private commercial banks on the area of financial performance (weakness and strength) which needs improvement. Furthermore, it gives insight about the current situations and performance of banks to the regulatory body, shareholders, investors and managers. Besides, it will be used as a reference to researchers that want further investigation into the area of study.
2. REVIEW OF LITERATURE

2.1 THEORETICAL LITERATURE REVIEW

The CAMEL approach of measuring financial performance was traced back its origin to 1979, when the Uniform Financial Institutions Rating System (UFIRS) was implemented in US banking institutions to introduce ratings for on-site examinations of banking institutions. Under this system, each banking institutions subject to on-site examination is evaluated on the basis of five critical dimensions relating to the bank’s operations & performance (Sahajwala & Van den Bergh, 2000). These are Capital, Asset Quality, Management, Earnings and Liquidity and are seen to reflect the financial performance, financial condition, operating soundness and regulatory compliance of the banking institution (Mulalem, 2015). Each of the component factors is rated on a scale of 1 (best) to 5 (worst). A composite rating is assigned as an abridgement of the component ratings and is taken as the prime indicator of a bank’s current financial condition. The composite rating ranges between 1 (best) and 5(worst), and also involves a certain amount of subjectivity based on the examiners’ overall assessment of the institution in view of the individual component assessments (Sahajwala & Van den Bergh, 2000).

Components of CAMEL Model

CAMEL which stands for capital adequacy, asset quality, management efficiency, earning and Liquidity. Those individual components used to measure the operational performance and soundness of banks.

Capital Adequacy

Capital adequacy measures the adequacy of the amount of capital to meet any unfortunate shocks that the bank may experience (Kosmidou, 2009), (Baral, 2005). As Ermias (2016) noted in his study, it reflects the overall financial condition of the banks and also the ability of management to meet the need for additional capital requirements. It is the capital expected to maintain balance with the risks exposure of the financial institution such as credit risk, market risk and operational risk, in order to absorb the potential losses and protect the financial institution’s (i.e banks) debt holder( Mulalem,2015), (Ahsan, 2016). Different scholars used different parameters to measure capital adequacy, Dang (2011), Hamdu et al, (2015),Mulalem,(2015) used capital to risk weighted asset and leverage ratio to measure the capital adequacy of the bank. On the other hand, Misra & Aspal (2013) examined the capital adequacy by dividing Capital to Risk Weighted Assets, Debt to Equity Ratio, Advances to Assets, and Government Securities to Total...

**Asset quality**

The asset quality of the bank is another bank specific variable that affects the Performance of a bank. The quality of Asset held by the individual bank affects the health of the bank. The dimension of asset quality is an important factor that helps the bank in understanding the extent of credit risk (Olweny, 2011; Baral, 2005). Chen et al, (2009) define credit risk as the risk of loss due to a debtor’s failure to make repayment of loan i.e principal and interest. Default occurs when a debtor unable to fulfill legal obligations according to the contract, or has violated a loan condition of the debt contract, which might occur with all debt obligations including bonds, mortgages, loans, and promissory notes(Kongri,2015). As stated by Grier (2007), poor asset quality is the major cause of the most bank failures. The asset quality indicators highlight the use of nonperforming loans ratios (NPLs) which are the proxy of asset quality, and the allowance or provision to loan losses reserve (Frost, 2004 as cited by Mulalem).

Hamdu et al (2015) used the ratio of loan loss provision to total loan and loan loss provision to total asset to evaluate asset quality of commercial banks. On the other hand, Mulualem (2015) NPLs to total loans, NPLs to total equity, Allowance for loan loss ratio. Altan et al.( l2014) Used the ratio of Fixed asset to total asset to examine the Asset quality of the bank.

Non-Performing loans to Gross Loans, Allowance for Doubtful loans to Loans outstanding, Gross NPAs to Net Advances ratio, Net NPAs to Net Advances ratio, Total Investments to Total Assets ratio, Net NPAs to Total Assets ratio, and Percentage Change in Net NPAs are some of the ratios considered to assess asset quality according to literatures by (Ermias, 2016; Tesfaye 2014; Mulualem2015; Anteneh et al., 2013; Minyahil ,2015)

**Management quality**

Management quality is basically the capability of the board of directors and management, to identify, measure, and control the risks of an institution’s activities and to ensure the safe, sound, and efficient operation in compliance with applicable laws and regulations (Uniform Financial Institutions Rating System 1997, as cited by Mulalem, 2014).
Earnings Quality

Earning quality mainly measures the profitability and productivity of the bank, explains the growth and sustainability of future earnings capacity (Ahsan, 2016). In the same way, bank depends on its earning to perform the activities like funding dividends, maintaining adequate capital levels, providing for opportunities for investment for bank to grow, strategies for engaging in new activities and maintaining the competitive outlook mainly derived from its earnings.

Different scholars try to use different financial ratios as a proxy to measure for management efficiency. Rahman et al (2009); Sangmi and Nazir, (2010) used the ratio of operating profit to income while Nassreddine et al (2013) used the ratio of costs to total assets. Golin (2001) used the ratio of operating costs to net operating income and operating expenses to assets ratio while Olweny (2011) adopted the ratio of operating costs to net operating income.

Liquidity Performance

Liquidity ratio measures the bank’s ability to meet its current obligation. Banks make money by mobilizing deposit and providing fund for creditors, so the bank needs to be conscious to meet the payment when depositors demands for. The inability of the bank to meet the demand of depositor leads to the liquidity risk. Therefore, the fund management practices should ensure an institution is able to maintain a level of liquidity sufficient to meet its financial obligations in a timely manner; and capable of quickly liquidating assets with minimal loss (Mulalem, 2015). Banks makes money by mobilizing short-term deposits at lower interest rate, and lending or investing these funds in long-term at higher rates, so it is hazardous for banks mismatching their lending interest rate.

2.2 Review of Empirical Evidences in Ethiopia

Mulalem(2015) has studied the financial performance of 14 commercial banks using CAMEL approach for the period 2010 -2014. The finding of his study showed that Wegagen bank stood at first position followed by Bunna International Bank and Lion International Bank while Construction and Business Bank secured the least position. In addition to descriptive he has used fixed effect regression model to investigate the impact of CAMELS factors on financial performance i.e ROA and ROE, were the result shows that capital adequacy, Asset Quality and Management efficiency have negative relation whereas earning and liquidity shows positive
relationship with both profitability measures with strong statically significance except Capital Adequacy which is insignificant for ROA whereas Asset quality for ROE.

Hamdu et al. (2015) assessed the soundness of selected commercial banks by referring audited annual reports from the year 2003-2013. The study result shows CAMEL framework is the best fit measurement for Ethiopian Banks and it give a comprehensive result which is very helpful for the governor to set a well determined policy and procedure.

Dakito (2015) investigated the performance of 8 commercial banks for the period of 2000-13 using CAMEL approach by descriptive and econometric analyses. The finding showed that NIB’s overall performance was good. Furthermore, he has measured the relationship between capital adequacy and financial performance using GLS regression model. The regression results exhibited the existence of positive relationship between capital adequacy and bank performance.

Ermias (2016) evaluated the financial Performance of six senior Private Commercial Banks over the period 2000-2014 using CAMEL model. The study found out that UNB, NIB, and BOA have held from 1st to 3rd rank based on the CAMEL model composite rating system. The findings also indicated that bank specific factors incorporated in the CAMEL model affect to the extent of 67.5% of the changes in profitability of the private commercial banks in Ethiopia.

Anteneh et al. (2013), on their study entitled health Check-up of Commercial Banks in Ethiopia, assessed the health of 8 private and public commercial banks using the 10 years annual report of each commercial banks (2000-2010) which were selected based on three criteria i.e., capital size of the banks, year of establishment and rank of banks in 2010 African banks rating. The study finding showed that the independent variables in CAMEL framework have highly explained the performance variables i.e., return on assets and return on equity. The private banks were in a better position than the public banks in terms of asset quality, management quality, and earning ability, while public banks were better in capital adequacy. However, liquidity position was high for both private and public commercial banks.

Minyahil (2013) measured the Performance of seven Commercial Banks of Ethiopia over the period 2004/5-2010/11. The result of the study showed that, during the study period, the performance of Commercial banks in Ethiopia mainly changes in accordance with NBE directives.
2.3 Conceptual Framework of the study

Asset Quality
- Fixed Assets / Total Assets
- Loan loss provision / Total Loans

Earning Quality
- Net interest Income / Total Assets
- Interest Income / Total Income

Capital Adequacy
- Total capital / Total Asset
- Total debt / total equity

Liquidity
- Liquid Asset / Total deposit

Financial performance
- ROA
- ROE

Management Quality
- Non Interest expense / Gross expense
- Net Profit / employee
- Total Deposit / number of branches
- Total Loan / number of branches
3. RESEARCH METHODS

3.1 Research design

In this study, a sort of explanatory research design was used to explain the relationship between bank’s performance and components of CAMEL by deriving quantitative data from the annual report of banks.

3.2 Target Population and Sample Design

The Target population of the study were 16 private commercial banks which was registered by NBE and operating banking businesses in Ethiopia. The researcher used purposive sampling to select 6 banks based on the years of the establishment (i.e. banks started the operation before 2007) and easily accessibility to annual report. The banks which were established after the year 2007 were excluded from the study because of the study covered a 10 years data, and those banks that does not fulfill the needed requirement for the number of annual report. This indicates that reasonable time is necessary to look the dynamics of banking business.

3.3 Data Sources

Since the study was conducted to measure the performance of private commercial banks using the CAMEL approach, which is highly depend on the data from audited financial reports. The study has relied on secondary source. Those data have been collected from the published and audited annual report of the selected private commercial banks. In addition to annual report, different documents and literatures records has been reviewed in order to realize the objective of the study.

3.4 Method of data analysis

The collected data were analyzed using both descriptive and inferential statistics tools. The researchers have been used descriptive statistical tools like mean, percentage, and ratios. Besides, panel regressions have been estimated to look the relationship among dependent and independent variables.
3.5 Model Specification

This study has used a sort of panel data regression model to analyze the collected data. Panel data is a bunch of cross section and time series observations. The following equations indicates the random effect model of the study with respect to two profitability indicators ROA and ROE.

\[
ROA_{it} = \beta_{11} + \beta_{2} TCTA_{it} + \beta_{3} \text{LEVERAGE}_{it} + \beta_{4} \text{FATA}_{it} + \beta_{5} \text{LLPTL}_{it} + \beta_{6} \text{NIEGE}_{it} + \beta_{7} \text{NPEP}_{it} + \beta_{8} \text{TDBRA}_{it} + \beta_{9} \text{TLBRA}_{it} + \beta_{11} \text{NIIITA}_{it} + \beta_{12} \text{IITI}_{it} + \beta_{13} \text{LATD}_{it} + w_{it}
\]

\[
ROE_{it} = \beta_{11} + \beta_{2} TCTA_{it} + \beta_{3} \text{LEVERAGE}_{it} + \beta_{4} \text{FATA}_{it} + \beta_{5} \text{LLPTL}_{it} + \beta_{6} \text{NIEGE}_{it} + \beta_{7} \text{NPEP}_{it} + \beta_{8} \text{TDBRA}_{it} + \beta_{9} \text{TLBRA}_{it} + \beta_{11} \text{NIIITA}_{it} + \beta_{12} \text{IITI}_{it} + \beta_{13} \text{LATD}_{it} + w_{it}
\]

Where, \( \beta_{11} \) indicates the random variable; \( \beta_{2} \ldots \beta_{13} \) are coefficients of the explanatory variables; \( i \) shows the cross sectional units or sampled private banks and \( t \) indicates the time periods from 2007-2016; \( w_{it} = \varepsilon_{i} + \mu_{i} \), consists of two components, \( \varepsilon_{i} \), which is the cross-section, and \( \mu_{i} \) which is the combined time series and cross section error component. The following table shows variables, notation and measures used in the study.

Table 1: Definition and Measurement of Study Variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Measure</th>
<th>Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROA</td>
<td>Net income / Total assets</td>
<td>It reflects the ability of a bank’s management to generate profits from the bank’s assets</td>
</tr>
<tr>
<td>ROE</td>
<td>Net income / Total capital</td>
<td>It measures a corporation's profitability by revealing how much profit a company generates with the money shareholders have invested.</td>
</tr>
<tr>
<td>TCTA</td>
<td>Total capital / Total asset</td>
<td>The ratio reflects the ability of a bank to withstand the unanticipated losses.</td>
</tr>
<tr>
<td>LEVERAGE</td>
<td>Debt / Equity</td>
<td>It indicates how much debt a company is using to finance its assets relative to the amount of value represented in shareholders' equity.</td>
</tr>
</tbody>
</table>

Capital Adequacy
<table>
<thead>
<tr>
<th>Asset Quality</th>
<th>FATA</th>
<th>Fixed asset / Total assets</th>
<th>It indicates how much fixed assets are hold by a company in comparison to total assets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LLPL</td>
<td>Loan loss provision / Total loan</td>
<td>It measures the strength of banks</td>
</tr>
<tr>
<td>Management Quality</td>
<td>NIEGE</td>
<td>Non-interest expense / Gross expense</td>
<td>It shows out of the gross expenses how much is the non-interest expense</td>
</tr>
<tr>
<td></td>
<td>NPEP</td>
<td>Net profit / No. of employees</td>
<td>It shows the surplus earned per employee</td>
</tr>
<tr>
<td></td>
<td>TDBRA</td>
<td>Total deposit / Branch</td>
<td>It shows average deposit mobilization per branch of a bank</td>
</tr>
<tr>
<td></td>
<td>TLBRA</td>
<td>Total loan / Branch</td>
<td>It shows average loan disbursement per branch of a bank</td>
</tr>
<tr>
<td>Earning Quality</td>
<td>NIITA</td>
<td>Net interest income / Total asset</td>
<td>It shows how much net interest income generated for each birr total assets</td>
</tr>
<tr>
<td></td>
<td>IITI</td>
<td>Interest income / Total income</td>
<td>It indicates how much interest income is gained in comparison to total revenue (income)</td>
</tr>
<tr>
<td>Liquidity</td>
<td>LATD</td>
<td>Liquid asset / Total deposit</td>
<td>It shows the ability of a bank to meet its financial obligations</td>
</tr>
</tbody>
</table>
4. DATA ANALYSIS AND INTERPRETATION

The study was analyzed based on descriptive and inferential analysis. Accordingly, these analyses are explained as follows;

4.1 DESCRIPTIVE ANALYSIS

Table 2: Capital Adequacy

<table>
<thead>
<tr>
<th>Name of the bank</th>
<th>TCTA</th>
<th>Leverage</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average</td>
<td>Rank</td>
<td>Average</td>
</tr>
<tr>
<td>DB</td>
<td>10.25%</td>
<td>6</td>
<td>8.87</td>
</tr>
<tr>
<td>AIB</td>
<td>11.70%</td>
<td>4</td>
<td>7.60</td>
</tr>
<tr>
<td>BOA</td>
<td>10.97%</td>
<td>5</td>
<td>8.31</td>
</tr>
<tr>
<td>WEGAGEN</td>
<td>16.79%</td>
<td>1</td>
<td>5.08</td>
</tr>
<tr>
<td>NIB</td>
<td>16.70%</td>
<td>2</td>
<td>5.02</td>
</tr>
<tr>
<td>UB</td>
<td>12.61%</td>
<td>3</td>
<td>7.25</td>
</tr>
</tbody>
</table>

(Source: Banks Annual report 2007-16)

As above table shows regarding the total capital to total asset ratios, WEGAGEN bank was at the top position with an average of 16.79% followed by NIB with an average ratio of 16.70, while Dashen bank was achieved the lowest position on an average of total capital to total asset ratio of 10.25%. Concerning the leverage ratio, NIB achieved top position on an average of 5.02 times followed by WEGAGEN (average 7.6), whereas, Dashen bank scored the least position.

Table 3: Asset Quality

<table>
<thead>
<tr>
<th>Name of the bank</th>
<th>FATA</th>
<th>LLPTL</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average</td>
<td>Rank</td>
<td>Average</td>
</tr>
<tr>
<td>DB</td>
<td>1.80%</td>
<td>3</td>
<td>0.20%</td>
</tr>
<tr>
<td>AIB</td>
<td>2.69%</td>
<td>5</td>
<td>0.51%</td>
</tr>
<tr>
<td>BOA</td>
<td>2.56%</td>
<td>4</td>
<td>0.54%</td>
</tr>
<tr>
<td>WEGAGEN</td>
<td>2.80%</td>
<td>6</td>
<td>0.80%</td>
</tr>
<tr>
<td>NIB</td>
<td>1.56%</td>
<td>2</td>
<td>0.53%</td>
</tr>
<tr>
<td>UB</td>
<td>1.44%</td>
<td>1</td>
<td>0.45%</td>
</tr>
</tbody>
</table>

(Source: Banks Annual report 2007-16)
As above table shows regarding fixed asset to total asset ratio, united bank was at the peak of the rest banks with an average ratio of 1.44% and WEGAGEN bank at the bottom of the bank with an average percentage of 2.8. In case of loan loss provision to total loan ratio, Dashen bank ranked first with least average ratio of 0.20% which was followed by united bank (with an average 0.45%), while WEGAGEN bank ranked at the bottom with 0.8%.

Table 4: Management Quality

<table>
<thead>
<tr>
<th>Name of bank</th>
<th>NIEGE</th>
<th>NPEP</th>
<th>NPBRA</th>
<th>TDBRA</th>
<th>TLBRA</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average</td>
<td>Rank</td>
<td>Average</td>
<td>Bank</td>
<td>Average</td>
<td>Rank</td>
</tr>
<tr>
<td>DB</td>
<td>60.43%</td>
<td>3</td>
<td>147,549.02</td>
<td>1</td>
<td>5,527,813.77</td>
<td>1</td>
</tr>
<tr>
<td>AIB</td>
<td>60.99%</td>
<td>4</td>
<td>106,392.96</td>
<td>5</td>
<td>3,664,468.37</td>
<td>4</td>
</tr>
<tr>
<td>BOA</td>
<td>57.06%</td>
<td>2</td>
<td>78,733.64</td>
<td>6</td>
<td>2,476,119.64</td>
<td>6</td>
</tr>
<tr>
<td>WEGAGEN</td>
<td>39.73%</td>
<td>1</td>
<td>120,852.60</td>
<td>2</td>
<td>3,853,896.54</td>
<td>2</td>
</tr>
<tr>
<td>NIB</td>
<td>61.52%</td>
<td>5</td>
<td>119,613.79</td>
<td>3</td>
<td>3,735,860.61</td>
<td>3</td>
</tr>
<tr>
<td>UB</td>
<td>64.41%</td>
<td>6</td>
<td>108,973.46</td>
<td>4</td>
<td>3,225,142.63</td>
<td>5</td>
</tr>
</tbody>
</table>

(Source: Banks Annual report 2007-16)

AS above table shows concerning the ratio of non-interest expense to gross expense ratio, WEGAGEN bank ranked at the top with the least average percentage of 39.73 followed by BOA (with an average of 57.06%) while United bank ranked at the bottom position with an average percentage of 64.41%.

Regarding net profit per employee, Dashen banks employees generated more average profit per employee than the rest banks with an average net profit of Birr 147,549.02 which was followed by WEGAGEN bank (with an average net profit of Birr 120,852.60), on the other hand, the employee of bank of Abyssinia generated the least net profit per employee with an average net profit of Birr 78,733.64.
Concerning net profit per branch, Dashen Bank was at the top position with an average net profit per branch of Birr 5,527,813.77, however Bank of Abyssinia at the lowest position with an average profit of Birr 2,476,119.64 per branch.

Regarding total deposit per branch, Dashen Bank was at the first place with an average deposit of Birr 147,159,903.46 per branch followed by united bank (with average deposit of birr 95,850,322.67 per branch). Conversely, WEGAGEN bank was at last place with an average deposit of Birr 83,952,141.83 per branch.

In contest of loan per branch, Dashen bank stood first by providing the loan of Birr 84,270,073.95 per branch while WEGAGEN bank was at last position by providing an average of Birr 50,170,185.12 loan per branch.

**Table 5: Earning Quality**

<table>
<thead>
<tr>
<th>Name of banks</th>
<th>NPM</th>
<th>NIITA</th>
<th>NIITII</th>
<th>IITI</th>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average Rank</td>
<td>Average Rank</td>
<td>Average Rank</td>
<td>Average Rank</td>
<td>Average Rank</td>
</tr>
<tr>
<td>DB</td>
<td>33.63% 2</td>
<td>2.71% 6</td>
<td>54.15% 6</td>
<td>55.67% 6</td>
<td>5 6</td>
</tr>
<tr>
<td>AIB</td>
<td>32.47% 4</td>
<td>2.89% 5</td>
<td>56.70% 5</td>
<td>58.27% 5</td>
<td>4.75 5</td>
</tr>
<tr>
<td>BOA</td>
<td>24.73% 6</td>
<td>3.32% 4</td>
<td>58.59% 4</td>
<td>67.91% 1</td>
<td>3.75 4</td>
</tr>
<tr>
<td>WEGAGEN</td>
<td>34.20% 1</td>
<td>3.55% 2</td>
<td>67.07% 2</td>
<td>58.32% 4</td>
<td>2.25 2</td>
</tr>
<tr>
<td>NIB</td>
<td>33.63% 2</td>
<td>3.88% 1</td>
<td>67.37% 1</td>
<td>63.91% 2</td>
<td>1.5 1</td>
</tr>
<tr>
<td>UB</td>
<td>29.91% 5</td>
<td>3.36% 3</td>
<td>60.30% 3</td>
<td>63.04% 3</td>
<td>3.5 3</td>
</tr>
</tbody>
</table>

(Source: Banks Annual report 2007-16)

As the above table shows, WEGAGEN bank ranked first with an average net profit margin of 34.2% followed by NIB and Dashen bank (were both achieved the net profit margin of 33.63% each), on the other hand Bank of Abyssinia achieved the least level with an average net profit of 24.73. With regard to net interest income to total asset ratio, NIB bank was at first position with an average ratio of 3.88% followed by WEGAGEN bank (average 3.55%) whereas, Dashen bank was at last place with an average of 2.71%.
Concerning the ratio of net interest income to total interest, WEGAGEN bank attained the highest compared to the rest competing banks with an average percentage of 67.37 while Dashen bank achieved the least with an average score of 54.15%.

**Table 6: Liquidity**

<table>
<thead>
<tr>
<th>Name of banks</th>
<th>LATD Average</th>
<th>Rank</th>
<th>TLTD Average</th>
<th>Rank</th>
<th>LATA Average</th>
<th>Rank</th>
<th>Group</th>
<th>Average</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB</td>
<td>41.99%</td>
<td>4</td>
<td>58.13%</td>
<td>1</td>
<td>33.81%</td>
<td>2</td>
<td>2.33</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>AIB</td>
<td>42.06%</td>
<td>3</td>
<td>59.88%</td>
<td>3</td>
<td>29.93%</td>
<td>5</td>
<td>3.67</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>BOA</td>
<td>38.90%</td>
<td>5</td>
<td>59.63%</td>
<td>2</td>
<td>31.49%</td>
<td>4</td>
<td>3.67</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>WEGAGEN</td>
<td>26.05%</td>
<td>6</td>
<td>60.83%</td>
<td>5</td>
<td>18.88%</td>
<td>6</td>
<td>5.67</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>NIB</td>
<td>45.83%</td>
<td>1</td>
<td>67.84%</td>
<td>6</td>
<td>32.33%</td>
<td>3</td>
<td>3.33</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>UB</td>
<td>44.70%</td>
<td>2</td>
<td>60.79%</td>
<td>4</td>
<td>35.00%</td>
<td>1</td>
<td>2.33</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

(Source: Banks Annual report 2007-16)

As above table exhibited the, liquid asset to total deposit ratio, NIB bank was at first place with highest average percentage of 45.83 which was followed by united bank (with an average percentage of 44.7), while Bank of Abyssinia was at last place with least average of 26.05%. Concerning total loan to total deposit ratio, Dashen bank ranked first followed by Bank of Abyssinia while NIB bank ranked to the least place. With reference to liquid asset to total asset ratio, united bank was ranked at the top with highest average percentage of 35, followed by Dashen bank with an average of 33.81%, on the other hand, WEGAGEN bank was ranked at last place with an average percentage of 18.88.

**Table 7: Composite Rating**

<table>
<thead>
<tr>
<th>Name of the bank</th>
<th>C</th>
<th>A</th>
<th>M</th>
<th>E</th>
<th>L</th>
<th>Average</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>1</td>
<td>3.2</td>
<td>3</td>
</tr>
<tr>
<td>AIB</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>4.6</td>
<td>5</td>
</tr>
<tr>
<td>BOA</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>4.6</td>
<td>5</td>
</tr>
<tr>
<td>WEGAGEN</td>
<td>1</td>
<td>6</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>3.4</td>
<td>4</td>
</tr>
<tr>
<td>NIB</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>2.2</td>
<td>1</td>
</tr>
<tr>
<td>UB</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>2.4</td>
<td>2</td>
</tr>
</tbody>
</table>

(Source: Banks Annual report 2007-16)
In order to assess the overall ranking of private commercial banks in Ethiopia, the composite rating has been calculated from the individual ranking of the banks for the period of 2007-16. As per the CAMEL model analysis, NIB bank ranked first, which was followed by United bank, and BOA and AIB stood at least position.

4.2 ECONOMETRIC ANALYSIS

At the outset the econometrics analysis, the required tests of classical liner regression model (CLRM) assumptions have been made. These tests were consists of multi collinearity, heteroskedasricity, model specification, normality of the data set etc. Accordingly, the data set consistent with the CLRM assumptions.

4.3 Panel Model Regressions

The term “panel data” refers to the pooling of observations on a cross-section of households, countries, firms, etc. over several time periods. Hence, this particular study has two dependent variables i.e. ROA and ROE. Two model regression estimations have been made.

To choose fixed or random effect of panel model, Hausman test has been estimated. Therefore, in both profitability estimation, random effect model were selected. Besides, robust estimation has been run to eliminate the effect of heteroskedasticity. The following tables show the regression result of both bank performance indicators;

**Table 8: Model one -Random effect GLS regression using ROA as dependent variable**

<table>
<thead>
<tr>
<th>Variable Type</th>
<th>ROA</th>
<th>Coef.</th>
<th>Std. Err.</th>
<th>t</th>
<th>P&gt;t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Adequacy</td>
<td>TCTA</td>
<td>.0022347</td>
<td>.0113115</td>
<td>0.20</td>
<td>0.843</td>
</tr>
<tr>
<td></td>
<td>LEVERAGE#</td>
<td>-.0005111</td>
<td>.0003436</td>
<td>-1.49</td>
<td>0.137</td>
</tr>
<tr>
<td>Asset Quality</td>
<td>FATA</td>
<td>.0485084</td>
<td>.0406766</td>
<td>-1.19</td>
<td>0.233</td>
</tr>
<tr>
<td></td>
<td>LLPTL</td>
<td>.0043679</td>
<td>.0034857</td>
<td>1.25</td>
<td>0.210</td>
</tr>
<tr>
<td>Management Quality</td>
<td>NIEGE</td>
<td>-.0272247</td>
<td>.0048438</td>
<td>-5.62</td>
<td>0.000 *</td>
</tr>
<tr>
<td></td>
<td>NPEP</td>
<td>1.90e-07</td>
<td>2.37e-08</td>
<td>8.02</td>
<td>0.000 *</td>
</tr>
<tr>
<td></td>
<td>TDBRA</td>
<td>-2.64e-10</td>
<td>5.11e-11</td>
<td>-5.17</td>
<td>0.000 *</td>
</tr>
<tr>
<td></td>
<td>TLBRA</td>
<td>2.94e-10</td>
<td>6.34e-11</td>
<td>4.64</td>
<td>0.000 *</td>
</tr>
</tbody>
</table>
Table 9: Model Two-Random effect GLS regression using ROE as dependent variables

<table>
<thead>
<tr>
<th>Variable Type</th>
<th>ROE</th>
<th>Coef.</th>
<th>Std. Err.</th>
<th>t</th>
<th>P&gt;t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital Adequacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TCTA</td>
<td></td>
<td>-.0940717</td>
<td>.1072618</td>
<td>-0.88</td>
<td>0.380</td>
</tr>
<tr>
<td>LEVERAGE#</td>
<td></td>
<td>.0224827</td>
<td>.0024189</td>
<td>9.29</td>
<td>0.000 *</td>
</tr>
<tr>
<td>Asset Quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FATA</td>
<td></td>
<td>-.1183003</td>
<td>.371222</td>
<td>-0.32</td>
<td>0.750</td>
</tr>
<tr>
<td>LLPTL</td>
<td></td>
<td>.0155652</td>
<td>.0434492</td>
<td>0.36</td>
<td>0.720</td>
</tr>
<tr>
<td>Management Quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NIEGE</td>
<td></td>
<td>-.1898971</td>
<td>.047033</td>
<td>-4.04</td>
<td>0.000 *</td>
</tr>
<tr>
<td>NPEP</td>
<td></td>
<td>1.63e-06</td>
<td>3.48e-07</td>
<td>4.67</td>
<td>0.000 *</td>
</tr>
<tr>
<td>TDBRA</td>
<td></td>
<td>-2.12e-09</td>
<td>6.57e-10</td>
<td>-3.24</td>
<td>0.001 *</td>
</tr>
<tr>
<td>TLBRA</td>
<td></td>
<td>2.49e-09</td>
<td>6.58e-10</td>
<td>3.79</td>
<td>0.000 *</td>
</tr>
<tr>
<td>Earning Quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NIITA</td>
<td></td>
<td>-2.649397</td>
<td>.792589</td>
<td>-3.34</td>
<td>0.001 *</td>
</tr>
<tr>
<td>IITI</td>
<td></td>
<td>.0131033</td>
<td>.0544532</td>
<td>0.24</td>
<td>0.810</td>
</tr>
<tr>
<td>Liquidity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LATD</td>
<td></td>
<td>.118805</td>
<td>.04880992</td>
<td>0.43</td>
<td>0.015 **</td>
</tr>
<tr>
<td>_cons</td>
<td></td>
<td>.0971755</td>
<td>.0429405</td>
<td>2.26</td>
<td>0.024</td>
</tr>
</tbody>
</table>

*, and ** = significant at 1 %, and 5% confidence level
No. of observations = 60
No. groups =10
Over all $R^2 = 83.11\%$
corr($u_i, X) = 0$ (assumed)
* indicates the variable is not measured in percentages

Source: (STATA result, 2017)
Table 8 and 9 presents the regression result of panel data using random effect models. The model was established based on the conventional methods of panel data model which is known as Static panel model.

On the above models, 84.74% and 83.11% of the variation in the dependent variables were explained by explanatory variables. The rest 15.26% and 16.89% were not explained by the above explanatory variables.

LEVRAGE, NIEGE, NPEP, TDBRA, TLBRA, NIITA, and LATD variables were significant in determining the profitability indicators-ROA and ROE.

As one of the capital adequacy proxy, leverage was positive and significant in determining the profitability indicator particularly-ROE. Ceteris paribus, a 1% change in this variable, it increases profitability measure by around 2.25 times.

All the management quality proxies were significant in affecting the profitability measurements in the above models. For instance, the impact of net interest expense over gross expense (NIEGE) revealed that, it had a negative magnitude and significant difference with both profitability measurements. Holding other variables constant, a 1% increases in NIEGE; it reduces profitability of sampled private banks by 2.72% and 18.99% on ROA and ROE, respectively. Although the slope of the rest management qualities variables-NPEP, TDBRA, and TLBRA are positive, there explaining power were very small.

Out of earning quality proxies, net interest income over total asset (NIITA) ratio had negative and significant relationship on both profitability models. Ceteris paribus, a 1% change in this ratio, it reduces profitability measures of ROA and ROE of sampled private commercial banks by 39.21% and 264.94% on the above models, respectively.

On the other hand, liquidity variable has captured by liquid asset by total deposit (LATD), showed that, it had positive and significant relation with profitability measurements-ROA and ROE. Holding other variables constant, a 1% change in this ratio, it increases the performance indicators of ROA and ROE of sampled private banks by 1.33% and 11.88 %, respectively. Although, this ratio had positive coefficient, its parameter was not that much highly significant.

Now a day, private banks are required to purchase government bonds while sanctioning loans to
their customers. Hence, they generate interest income from their investment. That why this variable had positive slope.

In conclusion, no asset quality proxies were significant in determining the performance indicators of both models.

4.3 HYPOTHESIS TESTING

The study had five general hypotheses along with sub- hypothesis in each general hypothesis. Indeed, these hypotheses are driven from previous empirical research works.

**H1: All else equal, there is no significant difference between capital adequacy ratios and performance of the banks**

The impact of leverage on bank profitability has showed negative parameter and significant at 1% level of significance, particularly, at ROE indicator. This negative association of leverage and bank profitability is in line with previous research works of (Anteneh et al., 2013). Therefore, the null hypothesis is rejected. On the other hand, the effect of TCTA on performance of banks was insignificant on both profitability indicators. Hence, the null hypothesis is accepted.

**H2: All else equal, there is no significant difference between asset quality ratios and performance of banks**

Both asset quality ratios used in this study were insignificant to explain the profitability measures. Therefore, the general null-hypotheses are accepted.

**H3: All else equal, there is no significant difference between management quality ratios and performance of banks**

All management quality ratios used in this study were significant in explaining both profitability indicators at 1% level of significance. For instance, the effect of NIEGE was negative and significant at 1% level of significance. The finding is consistent with previous research undertakings (Ermias, 2016). On the other hand, the rest management quality ratios-NPEP, TDBRA, and TLBRA were positive and significant at 1% level of significance. The finding is coincided with previous undertaking by (Rostami, 2015; Atlan et al., 2014). Therefore, the general null-hypotheses are rejected.

**H4: All else equal, there is no significant difference between earning quality ratios and performance of banks**
Out of earning quality ratios, only NIITA was negative and significant with respect to both bank performance measures. The negative association of NIITA and profitability measures is in line with prior research works in area (Atlan et al., 2014). Hence, the null hypothesis of the above specific variable is rejected.

**H5: All else equal, there is no significant difference between liquidity ratio and performance of banks**

As shown on the above random effect estimations, liquidity ratio was positive and significant with respect to both profitability measures. The positive association of liquidity and bank profitability is consistent with previous research works (Mulualem, 2015).
CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The study sought to examine the performance of private commercial banks of Ethiopia with the CAMEL ratings for the period 2007-2016. To conduct the study, secondary data particularly audited financial statements were collected from six sampled private banks. Besides, both descriptive and inferential analyses were used to analyze the data. The major findings of the study were as follows;

- In terms of capital adequacy indicators, WEGAGEN and NIB bank was rated first and followed by UB. DB had maintained the last position.
- With regard to asset quality measures UB bank placed first and followed by DB. WEGAGEN scored the last position.
- DB was rated first as per Management quality measures. Followed by WEGAGEN bank, while AIB scored the last position.
- In earning ability, NIB achieved the first position followed by WEGAGEN, whereas Dashen bank ranked least from the sampled banks.
- In terms of liquidity DB and UB have scored first, Followed by NIB, while WEGAGEN bank maintained the last position.
- According to the overall composite rating of CAMEL, NIB stood on the top followed by UB, whereas AIB and BOA banks stood the least.
- Banks with a composite rating of 4.0 or higher are considered to be problem banks (Madura, 2010). They are closely monitored, because their risk level is perceived to be very high. Accordingly, WEGAGEN, AIB, and BOA banks scored 4 and above rating on composite CAMEL ratings.
- On both panel model estimations, LEVRAGE, NIEGE, NPEP, TDBRA, TLBRA, NIITA, and LATD explanatory variables were significant in determining the profitability indicators-ROA and ROE. No asset quality indicators were significant in determining the profitability ratios.
5.2 Recommendation

Based on the findings of the study the following recommendations are forwarded.

- The study revealed that asset quality ratios, Management efficiency, Earning ability and Liquidity were the key drivers on profitability of private commercial banks in Ethiopia. Therefore, Bank managers are advised to give due attention to those variables to improve profitability.

- Those banks that achieved 4 or higher as per the composite CAMEL rating were considered as “weak”. Therefore, the National Bank of Ethiopia (NBE) has to give due attention in controlling these banks and in pursuing the CAMEL standard.

- Besides, AIB and BOA have achieved above 4 at composite rating, hence, these banks have to work hard in order to fulfill the CAMEL requirements and to secure their financial healthiness.
REFERENCES


Design of Vehicle Accident Prevention System Using Wireless Technology

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2Department of Mechanical Engineering, Faculty of Engineering, Takoradi Technical University, Ghana.
3Department of Mechanical Engineering, Faculty of Engineering, Takoradi Technical University, Ghana.

Abstract- Driver drowsiness is a significant factor in vehicular accidents and therefore different technologies are being put in place to bring it to the barest minimum. This paper takes in-depth look at vehicle accident prevention system using wireless technology, eye blink sensor and automatic braking system to ensure that the vehicle slows down and comes to a halt when drowsiness is detected, and the system (circuit) is not reset within the threshold period programmed in the microcontroller of the system. The wireless technology which is the backbone of this project work was achieve through radio frequency wave, is then used to send an information (slow down there is halt car ahead) to other vehicles at a transmission distance of wavelength 0.69m with a frequency of 433MHZ. Simulation software (Proteus) was used to critically analyzed the model of the design of the vehicle accidents prevention system using wireless technology. It was ascertained from the results that the vehicle accidents prevention system using wireless technology is an effective technology for vehicle accidents prevention due to driver drowsiness. The design of the vehicle accident prevention system using wireless technology, with the aim of sending information to other vehicles at a distance through RF module when drowsiness is detected was successfully implemented.

Index Terms- Wireless Technology (RF module), Wavelength, drowsiness, Automatic Braking system, Eye Blink Sensor.

I. INTRODUCTION

From the beginning of 2017, road traffic accident in Ghana has rampantly been in the increase, and one cannot deny the fact that many prominent people have lost their lives as a result of this unfortunate situation at stake; many have attributed this to the poor road network in Ghana neglecting the major causes of road accident [1]. There are many factors that contributes to the massive vehicular accident in Ghana of which drowsiness cannot be an exception. Annually many drivers in the U.S sacrifice sleep, and often overlooked dangerous behavior that results in nearly 83.6 million of them being sleep-deprived while behind the wheel every day, an estimated 5,000 lives lost in drowsy driving related crashes last year, all at an annual societal cost of something like $109 billion [2]. Causes of road traffic accidents are attributed to fatigue driving, especially drivers who travel long distance, over speeding, overtaking, overloading and non-maintenance of vehicle due to the poor nature of road [3]. The effects of driving while intoxicated result in drowsiness, loss of focus and inability to judge distances and reaction times [4]. Available statistics indicates that over 10,000 vehicles are involved in road traffic accidents which results in over 10,000 people getting injured through road traffic accidents. The statistics also shows that at least six (6) people are killed in road traffic accidents daily with 25% of the accidents victims involved are below the age 16 years and another 25% being in the range between 25 and 35 years of age, it is also found that speed is a contributory factor in 60% of the road traffic accidents cases while 70% of these road traffic accidents occur on straight and flat roads with male as the road traffic accidents victims [5]. In spite of the existence of powerful technologies, statistics shows that vehicular accidents are very disheartening. For instance, at least 1.2 million people are killed every year, globally through road accidents, with about 20 – 50 million suffering from various form of non – fatal injuries; over 90% of these road traffic accidents occurs in low – income and middle – income countries; for the situation at hand, it is predicted that road accidents will be the fifth leading cause of death by 2030 if an immediate action is not taken to curtail this unfortunate situation [6].

II. METHODOLOGY

This paper focuses on the detailed description of the methods employed to achieve the stated objectives and demystify the procedure of designing the model of the system. Programming and simulation was used to analyze the model to foretell the effectiveness of the design under study. Computer Software (proteus) was used in the circuit design and the simulation of the model of the vehicle accidents prevention system using wireless technology, automatic braking system and the eye blink sensor. Matrix laboratory (MATLAB) was used in analyzing the experimental results of this design.

III. DESIGN CONCEPT

The design focuses on the measurement and control of the eye blink using IR sensor to prevent vehicular accident whenever the driver becomes drowsy in the process of driving. The eye blink sensor serves as the detection unit which determines whether the driver is either drowsy or not during driving period and also the input to the control unit. The IR transmitter is used to transmit the infrared rays into the eyes. The IR receiver is used to receive the reflected infrared rays of the eye. If the eye is closed, it implies that the output of the IR receiver is high otherwise the output is low. Thus the high or low of the output of
the IR receiver determines whether drowsiness is detected or not. The Arduino Uno microcontroller is the principal component of the design, a power supply maintains the output voltage at a constant value of 5 V required by the microcontroller, a relay which uses a low voltage circuit for switching in order to control the state of the vehicle motor, braking motor and the buzzer. A buzzer which issues a warning signal to prompt the driver when drowsiness is detected, traffic indicators to alert nearby vehicle drivers, automatic braking system which gradually brings the vehicle to a halt and a wireless technology unit that sends information to vehicles in a transmission distance of wavelength of 0.69m.

IV. BLOCK DIAGRAM

The Vehicle accident prevention system using wireless technology, eye blink sensor and automatic braking system of the design is represented by the block diagram in figure 3.1

![Fig 3.1 Block Diagram of The Design]

The Vehicle accident prevention system using wireless technology, eye blink sensor and automatic braking system is represented by the logical model of the design in figure 3.2
Fig. 3.2 The Logical Flow (Flow Chart) Model of Vehicle Accident Prevention System using wireless, eye blink sensor and automatic braking system.

The circuit diagram of the vehicle accident prevention system using wireless technology, eye blink sensor and automatic braking system of the design is shown in figure 3.3.
**V. MODE OF OPERATION OF CIRCUIT (SYSTEM)**

The system consists of a microcontroller which is the brain of the circuit, an eye blink sensor that monitors the drowsiness of the driver, a buzzer which issues a warning signal to prompt the driver when drowsiness is detected, traffic indicators to alert nearby vehicle drivers, an automatic braking system which gradually brings the vehicle to a halt, and a wireless technology unit that sends information to nearby vehicles in a transmission distance of 300m and a wavelength of 0.69m. Starting the vehicle by turning on the ignition key, allows current to flow in the circuit, the microcontroller receives a signal (normal state) of the driver and displays on LCD drowsiness not detected. The microcontroller then sends a signal to the RF transmitter, it transmits this information to an RF receiver in other vehicles in a distance of 300m and a wavelength of 0.69m. When drowsiness is detected by the rate at which the driver blinks his/her eyes, the microcontroller receives deviation in signal from the eye blink sensor through the comparator circuit and sends signal to simultaneously activates the buzzer and the traffic indicators, the microcontroller then sends information about the fault to vehicles in the distance of 300m and a wavelength of 0.69m through the RF module and displays on the RF receiver in other vehicles that drowsiness is detected. This process will persist for three (3) seconds, and if the system is not reset by pressing the reset bottom, a signal from the microcontroller is sent to deactivate (turn-off) the engine of the vehicle by bringing on the braking motor to gradually bring the vehicle to a halt. The microcontroller then sends information through the wireless technology unit to vehicles in a distance of 300m and a wavelength of 0.69m on the receiver screen that slow down there is a halt car ahead.

**VI. RESULTS**

The results of the experiment on the eye against the level of drowsiness of the vehicle accident prevention system using wireless technology, eye blink sensor and the automatic braking system is represented by table 4.1.
Table 4.1 Experimental results on the eye against the level of drowsiness

<table>
<thead>
<tr>
<th>Number of Experiment</th>
<th>Rheostat Readings in Percentage (The Eye) %</th>
<th>Drowsiness Level in Volts (V)</th>
<th>LCD Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>Drowsiness not detected</td>
</tr>
<tr>
<td>2</td>
<td>30</td>
<td>1.50</td>
<td>Drowsiness detected</td>
</tr>
<tr>
<td>3</td>
<td>50</td>
<td>2.50</td>
<td>Drowsiness detected</td>
</tr>
<tr>
<td>4</td>
<td>85</td>
<td>4.25</td>
<td>Drowsiness detected</td>
</tr>
<tr>
<td>5</td>
<td>100</td>
<td>5.0</td>
<td>Drowsiness detected</td>
</tr>
</tbody>
</table>

The graphical representation of the drowsiness level against the rheostat (the eye) readings in percentage of Table 4.1 of the vehicle accident prevention system using wireless technology, eye blink sensor and automatic braking system is shown in figure 4.2.

![Graph of Rheostat Reading (the EYE) % against Drowsiness Level.](image)
VII. DISCUSSION

Table 4.1 shows the detailed result of the design of vehicle accident prevention system, using wireless technology, eye blink sensor and automatic braking system. For each test the rheostat (eye) levels were set and the drowsiness level were recorded. In all, five experiments were conducted at different ranges of the rheostat (eye) levels and the ranges are as follows: 0% → 0V, 30% → 1.50V, 50% → 2.50V, 85% → 4.25V and 100% → 5.0V. The 0% → 0V indicate the normal eye blinking condition of the driver which depicts that drowsiness is not detected. This happens when the rheostat representing the eye is set to 0% which then gives an output of 0V reading of the voltmeter. The 30% → 1.5V indicate the minimum level at which drowsiness is detected and this happen when the rheostat representing the eye is set to 30%, the corresponding output 1.5V is then fed to the comparator through the eye blink sensor. This compared signal is fed to a microcontroller, the microcontroller is programmed such that if the difference value exceeds the normal blinking state of the driver it sends information about the fault to particular part of the system as programmed in other to achieve the goal of the project. The 100% → 5.0V indicate the maximum level at which drowsiness is detected. The eye blink sensor is an infrared (IR) based and therefore at the normal vision where the eyes are opened, the IR output sensor falls below the threshold value (30%). At the instant the eyes are closed for a time greater than threshold value (30% of rheostat level), drowsiness is detected which causes the output of the IR sensor to rise above the set or the threshold value as shown in table 4.1. Figure 4.2 above shows the minimum and maximum levels within which drowsiness are detected. The above results are a clear indication that the logical flow model of vehicle accident prevention system using wireless technology, eye blink sensor. Automatic breaking system in chapter three (3) figure 3.2 is achieved. Metrics laboratory (MATLAB) was used in analyzing the experimental results of the design.

VIII. CONCLUSION

The certification of model was successfully achieved by a simulation software (proteus). The design of the vehicle accident prevention system using eye wireless technology with the aim sending signal (information) through a wireless technology at a transmission distance of wavelength 0.69m with a frequency of 433MHz to other vehicles when drowsiness is detected was successfully designed. The result obtained from the experiments clear indicate that vehicular accident due to drowsiness can be effectively reduce to the barest minimum by implementing the vehicle accident prevention using wireless technology.

IX. RECOMMENDATION

Further studies or research can be carryout in this area to incorporate a mechanism to retrieve previous information (incident) with date and time, whenever the system is reset in order to assist authorities to come out with clear judgment as to whether vehicle accident is due to driver drowsiness or not. It is further recommended that the Driver and Licensing Authority of Ghana, should come out with a policy in other to ensure that the vehicle accident prevention system using wireless technology are implemented in vehicles (cars) during licensing to ensure that vehicular accidents due to driver drowsiness are reduced to the barest minimum in the country.

ACKNOWLEDGEMENT

We wholeheartedly wish to render our gratitude to Professor Willie Ofosu of Penn State University. We really appreciate his wonderful impart, encouragement and support which made this work a successful one.

REFERENCES


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Phytochemical and Antimicrobial Properties of Vitellariaparadoxa Seed Oil Extracts on Staphylococcus Aureus and Candida Albicans

John Walter Chinaka, Nanlir Janfa, Oladejo Afolabi, Ya’u Hussaini, Sunday Oladipo

Federal college of forestry Jos, PMB 2019, Jos, Plateau state, Nigeria

Abstract- This research was carried out to evaluate the phytochemical and antibacterial effect of ethanol extract of Vitellaria paradoxa seed on Staphylococcus aureus and Candida albicans. The research was conducted at Microbiology laboratory of Federal college of Forestry, Jos. V. paradoxa seeds were collected from Bida, Niger State, Nigeria. Clinical isolates of S. aureus and Candida albicans were obtained from the stock culture of Microbiology Diagnostic Laboratory, N.V.R.I., Vom, Plateau State. Susceptibility testing was carried out using agar well method. 100, 50, and 25gm/ml concentrations of the extract was used to determine zone of inhibition and water served as control. Minimum bactericidal concentration (MBC) and minimum fungicidal concentration (MFC) was conducted using tube method at double fold dilution. MIC and MBC of the extract were tested at concentrations of 25, 12.5, 6.25, 3.125, 1.5625 and 0.7812mg/ml. Ciprofloxacin 20mg/ml served as positive control and replicated three time. The statistical analysis (One-way ANOVA) was employed at p>0.05, to determine the significant differences between the concentrations used. The result of the phytochemical of the plant seed revealed the presence of Glycosides, Tannins, Saponins, Alkaloids, Phenols, Steroids, and flavonoid. At the highest extract concentration (100mg/ml), the seed oil extract exhibited the highest antimicrobial activity of 20.7mm, while lower activity of 10.3mm was noted at the concentration of 25mg/ml against the tested isolates. The result obtained from MIC, MBC and MFC showed MIC at 3.125mg/ml, MBC at 6.25mg/ml and MFC at 12.5mg/ml respectively. The result showed significant difference between the concentrations used. The finding of this work suggest that seed oil extract of V. Paradoxa can be used against S. aureus and C. albicans.

Index Terms- Staphylococcus aureus, Candida albicans, Vitellariaparadoxa, Antibacterial, Antifungal, Phytochemical.

I.  INTRODUCTION

World Health Organization (WHO) investigation showed that more than 80% of the world’s population use traditional medicine for treating illness, Ammara, et al., 2009 [1]. Use of herbal medicines in Nigeria reveals a long evidence of human interactions with the nature. The medicinal important of herbal plantslies in some chemical compounds that produce a specific chemical action on the human body. These bioactive compounds of plants of medical importance include alkaloids, flavonoids, tannins and phenolic compounds, Edeoغا, et al., 2005 [2]. Developing countries like Nigeriarelies on plant materials specially for herbal medicines, food, forage, construction of houses, making household equipments, sleeping mats, and for fire and shade. The use of botanicals as drugs is well known in rural areas of many developing countries, Sandhu and Heinrich, 2005 [3] and Gupta et al., 2005 [4]. Herbal practitioners believes that their medicine is cheaper, more effective and causes less side effects as compared to synthetized drugs. In developing countries like Nigeria, poor people such as farmers, rural dwellers and native communities use traditional medicine for the treatment of common illness, Rojas, et al., 2006 [5].

The increasing microbial resistance to drugs has become a worrisome issue worldwide, Gardam, 2000 [6]. Medical practitioners consider drug-resistant microorganisms a major problem in the treatment of sick individuals, Lepape, et al., 2009 [7]. Expanding microbial resistance is necessitating a desire in research of the antimicrobial role of botanicals against resistant strains, Alviano and Alviano, 2009 [8]; HemaSwarya, et al., 2008 [9]. High number of medicinal plants have been seen as important resources of organic antimicrobial substances, Mahady, 2005 [10]. These botanicals are said to contain plenty medical values such as antimicrobial, antimitagenic, anticarcinogenic, antithrombotic and vasodilatory activities, Bidlacket al., 2000 [11]. It is therefore the aim of this study is to verify the antimicrobial activity of Vitellaria paradoxaplant so as to find an alternative for the common antibiotics presently in use.

II. MATERIALS AND METHODS

A. Study area

Plateau state is located between Latitudes 8.50°-100.46°North and Longitudes 8.20°-10.36°East in the North-Central zone of Nigeria (Dasheet et al., 2013). The area falls under Natural Region II of Nigeria’s agro-ecological zones, the climate of the area is humid with an average annual rainfall and temperature between 140-1480 mm and 10°-32°C respectively.

B. Preparation of the Seeds for Extraction

Shea butter (V. paradoxa) seeds (nuts) were obtained from Bida, Niger State, Nigeria. The seeds were pulverized and dried under room temperature for a 24hrs and followed by oven drying for three hours at 50 °C to ensure adequate removal of moisture content.

C. Extraction of Oil from Seeds

The collected seeds were dried in Oven at 70 °C to obtain a constant weight, pulverized. Soxhlet extractor with ethanol as solvent was used. The mixture was allowed to cool after
extraction, followed by filtration to remove solid particles. The residue was concentrated under vacuum in a rotary evaporator, Akpan, et al., 2005 [12]. The obtained oil underwent physicochemical analysis to detect physical and chemical properties of the extracted seed oil. Standard reagents were used all through.

D. Gum removal and Purification

This was done according to the method of Akpan, et al. 2005 [12]. The extracted oil was subjected to 60°C heating, followed by addition of activated carbon (purchased from the market) into the heated oil, this causes oil to change colour. The decolorized oil was mixed with sterilized distilled water thoroughly and subjected to heating again at 60°C, stirred thoroughly for 15 minutes, sieved, cooled and the residue on the filter paper was discarded. The oil finally obtained was transferred into a 50ml conical flask and kept in a refrigerator until needed.

E. Preparation of Ethanolic Extracts

*V. paradoxa* seed oil extract (100g) was introduced into an air-tight sterile jars containing 100 ml of the solvent (95% ethanol) and kept on a shaker (150 rpm) with uniform shaking for 24 hours at 25°C. The ethanol containing the extracts was removed using muslin cloth and followed with Whatman no. 1 filter paper respectively. Further extraction of the powdered samples was done with same volume of 95% ethanol, separated and filtered two more times. The filtrates from each round of extraction were combined and were evaporated to dryness in small, open-mouth jars and then packed in separate clean dry bottles and kept at 25°C until need, Ajijolakewu and Awarun, 2015 [13].

F. Quantitative analysis

For the separation of various fraction, 350g of *Vitellallariaparadoxa* seed oil extract was dissolved in 300ml of 70% ethanol and allowed to stand 24 hours in a separating funnel clipped to a stand. The tap was then opened to allow the dissolved extract to drain into an evaporating dish. The filtrate was concentrated to dryness at 60°C using a water bath until the liquid portion was removed. About 25.3g of dried solid portion obtained was re-dissolved in 250ml of distilled water and shaken vigorously. The suspension was filtered and the filtrate used for separation into various phytochemical fractions. Glycoside fraction was extracted with 5% KOH in n-butanol, saponin was extracted with 10% HCL in n-butanol while alkaloid was extracted in chloroform. Flavonoid were obtained from the aqueous fraction of glycoside, saponin and alkaloid.
G. Sterility of Extracts

Each of the extracts was examined for sterility. This was carried out by making serial dilution of 1 g of each extract $10^4$ to $10^6$. Ten microliters (10 μl) of the sample were inoculated aseptically on the sterilized Nutrient Agar plates and incubated at 37 °C for 24 hours. The incubated media plates were observed for microbial growth. Absence of microbial growth on the media plate indicated sterility. Sterile extracts were used to test for antimicrobial study.

H. Sources of Bacterial and Fungal Isolate

Clinical isolates of *Staphylococcus aureus* and *Candida albicans* were obtained from the stock culture of Microbiology Section of Central Diagnostic Laboratory, N.V.R.I., Vom, Plateau State.

I. Standardization of the Test Organism

Five colonies of bacterial and fungal isolates were inoculated into a prepared sterilized nutrient broth and incubated at 37° C for 24 and 48hrs respectively. Turbidity produced was adjusted to 0.5 McFarland Standard using a Nephelometer (TREK Diagnostics) for the bacteria while the fungal isolate was set at 10^6 CFU/ml, Agada *et al*., 2012 [14].

J. Determination of Antimicrobial Activity

Antimicrobial activity of the ethanolic extract of the plant sample was evaluated by the discs diffusion method. Four ditches were bored using a cork borer equidistant from each other. Using a micropipette, 100ul of the extract at predetermined concentrations (100mg/ml, 50mg/ml and 25mg/ml) was introduced into the ditches. The standardized bacterial inoculum was flooded on nutrient agar, while the fungal isolate was flooded on potato dextrose agar. There were done in triplicates, alongside the controls. Plates were incubated at 37° C and 30° C for bacteria and fungal isolates respectively for 24 h. Antibacterial and antifungal activity of the oil was examined by measuring zone of inhibition, Agada *et al*., 2012 [14]. The antimicrobial effect of the ethanolic oil extract was expressed as the mean of the zones of inhibition (in millimeter).

K. Determination of Minimum Inhibitory Concentration (MIC)

MIC of the oil was examined for each of the test microorganisms in triplicates. 0.5ml of different concentrations of the extracts (50, 25, 12.5, 6.25, 3.125 mg/ml), was added to 4.5ml of nutrient broth and then 100ul of the test organism were inoculated into the tubes. The bacteriological peptone was poured into test tube in appropriate was poured into test tube in appropriate volumes. Tubes one will contain only 1.0ml of the stock concentration. 10.0ml of stock was added in test tubes numbered 2 to 4. 1ml of each extract was added into each of test tubes (numbered 2 to 4). Using pasture pipette, to achieve even dilution and distribution of extract within the broth, the contents were mixed thoroughly. 1.0ml of the mixture was withdrawn from tube 2 and transferred into tube 3 number 3 evenly mixed and incubated at 37°C for 24 hours, after which microbial growth was observed. Those which were clear (no turbidity), do not have microbial growth. This was considered the minimum inhibitory concentration of the extract (the lowest concentrated that prevented visible growth). The experiment for positive control was conducted on the test organisms using purchased antibiotics (ciprofloxacin and ketoconazole, 20mg/ml for bacterial and fungal isolates respectively). Nutrient broth without extract inoculated with the test organisms as described above to serve as control. Tubes containing bacterial cultures were then incubated at 37° C for 24 h while tubes containing fungal isolates were incubated for 72h at 30° C. After 24 and 72hr, the incubated samples were then examined for visible turbidity indicating microbial growth, Agada *et al*., 2012 [14].
**Figure 4: Determining MIC**

*M. Determination of Minimum Bactericidal and Fungicidal Concentration (MBC and MFC)*

Using a sterile wire loop, a loopful of broth from incubated tubes showing no growth were streaked on sterile nutrient agar and potato dextrose agar for bacterial and fungi respectively. Nutrient agar and potato dextrose agar were streaked with the test organisms to serve as control. Plates inoculated with bacteria were then incubated at 37°C for 24 h while fungi inoculated plates were incubated at 30°C for 72 h. After incubation, the concentration at which no growth was observed was recorded as the MBC, Agada, et al., 2012 [14].

**Figure 5: Determining MBC and MFC.**

**N. Statistical Analysis.**

Data collected were analyzed using analysis of variance, ANOVA to determine the significant difference between the concentrations of the *Vitellariaparadoxa* plant extract and mean separation were made using Duncan multiple ratio test, DMRT.

**III. RESULTS AND DISCUSSION**

**A. Results**

<table>
<thead>
<tr>
<th>s/no</th>
<th>Sample</th>
<th>constituent</th>
<th>Test Reaction</th>
<th>Colour observed</th>
<th>Result</th>
<th>Quantity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>V.paradoxa seed oil extract (25g)</td>
<td>Saponins</td>
<td>Frothing</td>
<td>-</td>
<td>+</td>
<td>0.41</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Tannins</td>
<td>Precipitate</td>
<td>Dark green</td>
<td>+</td>
<td>0.27</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Alkaloid</td>
<td>Precipitate</td>
<td>Reddish brown</td>
<td>+</td>
<td>0.25</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Flavonoid</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Phenols</td>
<td>Precipitate</td>
<td>Light brown</td>
<td>+</td>
<td>0.28</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Steroid</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>Carbohydrate</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>Resins</td>
<td>Forming</td>
<td>Brown</td>
<td>+</td>
<td>0.27</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td>Forming</td>
<td>Bluish</td>
<td>+</td>
<td>0.24</td>
</tr>
</tbody>
</table>
8

Key: (+) = present  (-) = absent.

Table 2: Effects of difference of concentration extract (mg/ml) on Candida albicans and Staphylococcus aureus

<table>
<thead>
<tr>
<th>Concentration (mg/ml)</th>
<th>Candida albicans (mm)</th>
<th>Staphylococcus aureus (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>16.7&lt;sup&gt;a&lt;/sup&gt;</td>
<td>20.7&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>50</td>
<td>13.0&lt;sup&gt;b&lt;/sup&gt;</td>
<td>17.6&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>25</td>
<td>10.3&lt;sup&gt;c&lt;/sup&gt;</td>
<td>13.6&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Control</td>
<td>0.00&lt;sup&gt;d&lt;/sup&gt;</td>
<td>0.00&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Means followed by the same superscript are not significantly different (p>0.05) LSD at (0.05)

Table 3: Effects of Ethanolic Extract on Minimum Inhibitory Concentration against Candida Albicans

<table>
<thead>
<tr>
<th>MIC (mg/ml)</th>
<th>C. albicans</th>
<th>+ control</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.25</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>12.5</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>6.25</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>3.125</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>1.5625</td>
<td>1.25</td>
</tr>
<tr>
<td></td>
<td>0.7812</td>
<td>0.625</td>
</tr>
</tbody>
</table>

Key: - no visible turbidity, + visible turbidity

Table 4: Effects of Ethanolic Extract on Minimum Fungicidal Concentration against C. albicans

<table>
<thead>
<tr>
<th>MFC (mg/ml)</th>
<th>C. albicans</th>
<th>+C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.5</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>12.5</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>6.25</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>3.125</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>1.5625</td>
<td>1.25</td>
</tr>
<tr>
<td></td>
<td>0.7812</td>
<td>0.625</td>
</tr>
</tbody>
</table>

Key: - no growth; + growth

Table 5: Effects of Ethanolic Extract on Minimum Inhibitory Concentration against Staphylococcus aureus

<table>
<thead>
<tr>
<th>MIC (mg/ml)</th>
<th>S. aureus</th>
<th>+ control</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.125</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>12.5</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>6.25</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>3.125</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>1.5625</td>
<td>1.25</td>
</tr>
<tr>
<td></td>
<td>0.7812</td>
<td>0.625</td>
</tr>
</tbody>
</table>

Key: - no visible turbidity, + visible turbidit

Table 6: Effects of Ethanolic Extract on Minimum Bactericidal Concentration against Staphylococcus aureus

<table>
<thead>
<tr>
<th>MBC (mg/ml)</th>
<th>S. aureus</th>
<th>+ C.</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.25</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>12.5</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>6.25</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>3.125</td>
<td>2.5</td>
</tr>
<tr>
<td></td>
<td>1.5625</td>
<td>1.25</td>
</tr>
<tr>
<td></td>
<td>0.7812</td>
<td>0.625</td>
</tr>
</tbody>
</table>

Key: - no growth; + growth

POSITIVE CONTROL: C. albicans Ketoconazole 20 mg/ml, S. aureus Ciprofloxacin 20mg

B.Discussion
Analysis of the plant extracts revealed the presence of phytochemicals such as tannins, flavonoids, saponins, glycosides, steroids, resins and alkaloids. The presence of tannin, alkaloid, Saponin, has been reported to possess antimicrobial activities on different organism, Akujobi et al., 2004 [15]. Bioactive components of plant extracts affect the cell membrane integrity microorganisms, Ibeke we et al., 2000 [16]. The zone of inhibition with highest diameter as indicated in table 4 was obtained using 100mg of the extract which gave 20.7mm and the lowest ZOI is 10.3mm at the lowest concentration (25mg). Decrease indifferent extract concentration led to a direct reduction of the inhibition zone around each test microorganism. Similar observation by Adamu et al. [17] and Arekemase et al. 2013 [18] had suggested that higher concentrations of antimicrobial compounds gave appreciable antimicrobial efficacy.

The pattern of antimicrobial activities of the plant extracts and the zone of inhibition (mm) of the bacteria and fungi are in agreement with Adegoye et al. 2008 [19], who revealed varying degrees of against gram negative bacteria. The plant had profound activities against both fungi and bacteria. There was however, more activity against the bacteria organism than the fungi. Pelczaret al. 1993 [20] suggested that the difference in susceptibility of microorganismstoa various antimicrobial agents probably depends on structural differences in their cell walls. For example, amount of peptidoglycan, presence of receptors and lipids, nature of cross linking, activity of autolytic enzymes that determined the penetration, binding and activity of the antimicrobial agents. The marked difference in the effects of the extracts on the organism therefore, is suggestive of the activity against each cell wall components of the organism. The antimicrobial substance appears to exert antimicrobial activity by inhibiting the growth of and by killing the sensitive microbe. This particular finding was also encountered by Emeruwa, 1982 [21] in his study on the antifungal activity from Carica papaya fruit extract.

Staphylococcus aureus and Candida albican were susceptible to ethanol seed oil extract of V. paradoxa at 50mg/ml and 25mg/ml, concentrations. This corroborated the claims of Esimone et al. 2008 [22], that wider range of susceptibility are usually recorded by gram negative bacteria. The lowest inhibition concentration of 6.25mg/ml and 12.5mg/ml recorded for Candida albicans and Staphylococcus aureus were similar to 12.5mg/ml of Combretum sp reported by Esimone et al. 2008 [22], inhibition against Salmonella typhi.

The lowest minimum bactericidal and fungicidal concentrations 6.25 and 3.125mg/ml respectively of the seed oil extracts against test organisms confirmed the findings of Anibijuwon and Udeze, 2009 [23] who posited that methanolic extracts of Combretum adenogonium showed activities against S. aureus This result also correlates with the work of Mann et al. 2011 [24] who reported that the methanolic and hexane extracts of Bombax buonopozense had antimicrobial activity against Aspergillus niger, Staphylococcus aureus and Escherichia coli.

IV. CONCLUSION

The result obtained in this research work indicates that the leaves of Vitellaria paradoxa contain antimicrobial substances which is both bacteriostatic and bacteriocidaland fungicidal and fungicidal on Staphylococcus aureus and Candida albicans. However the varied widely in their degree of susceptibility to the plant extracts. Through such research as this, natural product of plant origin have been obtained for human use. For instance, Aloe vera product from Ghana are a source of export earning for that country. Several herbal products are known to be produced in India today including herbal toothpaste which are in Nigeria markets. Further studies involving other concentrations not considered in the current effort should be carried out. Other vegetative parts of the plant should be screened for their phytochemicals and their antimicrobial potentials.

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REFERENCES


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Effectiveness of An Educational Program upon Nurse's Knowledge concerning Facilitated Tucking Position during Venipuncture at Neonatal Intensive Care Unit at AL-Battol Teaching Hospital in Diyala Governorate

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Abstract:

Objectives: To assess nurses’ knowledge regarding the facilitated tucking position during venipuncture, and assess the effectiveness of education program among nurses by comparing the pre- and post-test knowledge scores regarding the facilitated tucking position, and it is also, to determine the relationship between the pre- and post-test knowledge scores and the demographic variable of nurses by a Non-probability (purposive sample) of (25) all of them day shift working in Neonatal intensive care units (NICU) at AL-Batool teaching hospital.

Methodology: A semi experimental study is conducted throughout the period of (November 24th 2017 until June 30th ,2017). The Sample is selected for the purpose of the study. The reliability of the questionnaire which is determined through a pilot study and the validity are achieved through a panel of (13) experts. The overall items, which are included in the questionnaire, are (26). These items are divided into (4) sections which include nurses’ knowledge toward pain, nurses’ knowledge toward facilitated tucking position, nurses’ knowledge about the importance of facilitated tucking position, and nurses’ knowledge about action of facilitated tucking position. The data have been collected by using self-administration method to answer questionnaire format, Implementation of the Educational program required (3) lectures at (10) days interval period. The (pretest) data collected before application of the program. Then the (post-test 1) data collected immediately after application of the program and recollected the (post- test 2) after (1) month from (first post-test) data collection.

Results: The study results indicate that the sample gender just female, number of years of experience in nursing field 20(80.0%) had service of (1-4) years in the employment. The nurses’ knowledge discovered that their knowledge at low level before the beginning of an educational program and become moderate level after first and second follow up of an education program post one and post two.
Conclusion: The study concludes that Most of the study sample cannot use facilitated tucking position to relief pain before conducted program, as well as, a measurable huge relationship between attendants’ learning and their general data (age, level of education, Years of experience in nursing field, Years of experience in neonatal intensive care units) there is statistical significant association between their general information related to (Ability to relief pain for infant during venipuncture, pharmacological method, facilitated tucking position, breast feeding and other) at the post test.

Recommendation: The study recommends that the decision makers need to direct their emphasis toward the educational aspects at neonatal intensive care unit by providing educational posters, guidelines, pamphlets and manuals, and initiate policy to providing a special educational session for using non-pharmacological methods to relief pain.

Key words: Effectiveness, Education Program, Facilitated, Tucking Position, Venipuncture, Nurses.

I. INTRODUCTION

Pain is a complex and multidimensional phenomenon that preterm infants experience in the neonatal intensive care unit (NICU) In the NICU; infants are exposed to a high number of painful procedures. Neonatal care involves many diagnostic and therapeutic procedures that are associated with pain \(^1\). It is estimated that infants in the NICU will undergo an average of 14 painful procedures each day. Despite this number, pain relief measures are used inadequately in the NICU \(^2\). Exposure to pain at this young age can have long-term consequences on the development of an infant’s brain, due to the deleterious effects on nociceptive neural circuits. Alterations of the pain system during early development can lead to lower pain thresholds, as well as cognitive and behavioral deficits as the infant matures, therefore, Stress reduction and pain management are essential components of neonatal care \(^3\). From the above-mentioned, it is obvious that effective pain management is an important indicator of the quality of care provided to neonates, not only from an ethical standpoint, but also in terms of protecting the long-term outcome. Neonates cannot assert their rights, and their reactions to pain are not as evident as in adults \(^4\). Pain management can be classified as either pharmacological or non-pharmacological. A study of the effect of continuous administration of morphine in ventilated preterm infants showed no beneficial analgesic effect. Pharmacological management of pain has been rendered more difficult by the lack of good and reliable measures of a baby’s response to pain \(^5\). In the last decades, non-pharmacological analgesic interventions were developed and published with the objective to reduce minor short term pain and discomfort after invasive interventions. These non-pharmacological analgesic interventions can be beneficial in minor pain and discomfort and may replace or be given in addition to analgesic pharmacological agents. Several intervention methods are tested in NICU settings \(^6\). The use of non-pharmacological techniques is important for Nursing practice because their use is determined from the nurse’s assessment and can be Performed independently \(^7\).
II. METHODOLOGY

Objectives of the study: The study aims at:

1. Assessing the effectiveness of education program among nurses by comparing the pre- and post-test knowledge scores regarding the facilitated tucking position.
2. Finding the relationship between the pre- and post-test knowledge scores and the demographic variable of nurses.

Study Design: A quasi experimental design study was conducted on all nurses working at day shift in neonatal intensive care units (NICU) at Al-Batool teaching hospital between November 24th 2017 until June 30th, 2017.

Sample of the study: Non-probability (purposive sample) of (25) all of them day shift working in Neonatal intensive care units (NICU) at Al-Batool teaching hospital.

Study instrument: A questionnaire was designed and Constructed by the investigator for the Purpose of the Study to assessing of nurses' needs for knowledge toward facilitated tucking position during venipuncture depended on relevant scientific literature and previous studies (8), translated to Arabic language according to education levels of Study Samples, The study questionnaire consist of Two Parts: the First Part is related to Nurses' General Information (6 Items) and The Second Part is related to Nurses' Knowledge toward Facilitated tucking position during venipuncture consist of (26) Items divided into (104)sub items, These Items have been Scale of the questionnaire is (multiple choice) the correct answer code was (2) and the wrong answer code was (1). The questionnaire form consists of two parts include:

Part I: the demographic data include nurses’ general information such as: (age, level of education, Years of experience in nursing field, Years of experience in neonatal intensive care units, Did you now the non-pharmacological methods to relief pain during, Can you relief pain for child during venipuncture, If the answer is yes and Witch methods).

Part II: Part 2 is concerned with Assessment of Nurses' Knowledge before and after program was composed of (26) Items divided into (104) sub items. The test covers relevant points from major content area of educational program, for the purpose of this study, the number of correct response or The knowledge questionnaire is used as the measure level of knowledge. The nurses in the study have been given knowledge test prior to the implementation of educational program and were retested after implementing the educational program.

Validity and Reliability: The content of validity for the early developed instrument and program was determined through the panel of expert who has had more than 7 years’ experience in their specialty field. They have been asked to review the program and instrument for content, clarity,
relevancy, and adequacy. Changes and modification were made with respect to the experts’ suggestions and recommendations.

**Statistical analysis:** The statistical data analysis approach by using (SPSS-ver.20) is used in order to analyze and evaluate the data of the study. A descriptive statistical data analysis approach used to describe the study variables: which include frequencies, percentages, and standard deviation; and Inferential statistical data analysis approach: used by application of the Chi-square test.

### III. RESULTS

**Table (1): Socio-Demographic Characteristic of the Study Sample**

<table>
<thead>
<tr>
<th>Demographic data</th>
<th>Rating</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>20 to25</td>
<td>15</td>
<td>60.0</td>
</tr>
<tr>
<td></td>
<td>26 to31</td>
<td>8</td>
<td>32.0</td>
</tr>
<tr>
<td></td>
<td>32 to 38</td>
<td>2</td>
<td>8.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>25</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Mean ± S.D</strong></td>
<td></td>
<td>1.48 ± 0.653</td>
<td></td>
</tr>
<tr>
<td><strong>Level of education</strong></td>
<td>Junior Nursing</td>
<td>15</td>
<td>60.0</td>
</tr>
<tr>
<td></td>
<td>Nursing Institute</td>
<td>4</td>
<td>16.0</td>
</tr>
<tr>
<td></td>
<td>College of Nursing and Older</td>
<td>6</td>
<td>24.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>25</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Years of experience in the field of Nursing</strong></td>
<td>1 to 4</td>
<td>20</td>
<td>80.0</td>
</tr>
<tr>
<td></td>
<td>5 to 9</td>
<td>2</td>
<td>8.0</td>
</tr>
<tr>
<td></td>
<td>10 to 14</td>
<td>3</td>
<td>12.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>25</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Years of experience in the Neonatal intensive care unit</strong></td>
<td>1 to 3</td>
<td>20</td>
<td>80.0</td>
</tr>
<tr>
<td></td>
<td>4 to 7</td>
<td>2</td>
<td>8.0</td>
</tr>
<tr>
<td></td>
<td>8 to 11</td>
<td>3</td>
<td>12.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>25</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Did you know the non-pharmacological methods to relief pain during venipuncture</strong></td>
<td>No</td>
<td>12</td>
<td>48.0</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>13</td>
<td>52.0</td>
</tr>
<tr>
<td><strong>Can you relief pain for child during venipuncture</strong></td>
<td>No</td>
<td>10</td>
<td>40.0</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>15</td>
<td>60.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>25</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>If yes what the methods</strong></td>
<td>Pharmacological methods</td>
<td>No</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>7</td>
<td>28.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>15</td>
<td>60.0</td>
</tr>
<tr>
<td></td>
<td>Facilitating tucking position</td>
<td>No</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>2</td>
<td>8.0</td>
</tr>
</tbody>
</table>
Results reveals that the majority 15(60.0%) of nurses in the study sample are within the age group (20 - 25). Concerning the level of educational, most of nurses 15(60.0%) in the study sample were junior. In relation to the number of years of experience in nursing field 20(80.0%) nurses in the study sample had a service (1-4) years in the employment while years of experience in neonatal intensive care unit 20(80.0%) of nurses had an experience of (1-3) years. The knowledge of nurses about the non-pharmacological methods to relief pain during venipuncture the nurses answer by (NO) 12 (48.0%) and the other answer by (YES) 13 (52.0%). The ability of nurses to relief pain for child during venipuncture answer by (YES) 15 (60.0%) and the other answer by (NO) 10 (40.0%), if yes what is the method, the first question about the Pharmacological methods answer by NO 8(32.0%) and the other answer by YES 7(82.0%). Second question about the facilitated tucking position if she known use it and the answer is NO 13(52.0%) and other answer by YES just two(8.0%). The third question about the using breast-feeding and the answer was NO 9 (36.0%) and other by YES was six (24.0 %). Fourth question in this figure about music method all body answer by NO 15(60.0%). Last question about using other method for relief pain the answer was YES 10(40.0%) and the other answer NO 5(20.0%).

Table (2) Distribution of study sample by their Overall of Nurses Knowledge toward Facilitated Tucking Position during Venipuncture

<table>
<thead>
<tr>
<th>Overall assessment for study sample</th>
<th>Pre-test</th>
<th>Post-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq</td>
<td>%</td>
</tr>
<tr>
<td>Pass</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fail</td>
<td>25</td>
<td>100</td>
</tr>
</tbody>
</table>

\[ t\text{-value}( -8.803), \text{d.f.} (24), \text{significance} (0.000) \]
Regarding subjects of nurses knowledge concerning Facilitated Tucking Position during Venipuncture table (4-6) shows summary statistics such that, frequency, percentage, mean of score, and standard deviation are included for assess responding levels for studied sample either for pre period of time or after applying educational program for studying questionnaire’s items concerning overall nurse’s knowledge.

Results show that all of questionnaire’s items in light of this part are assigned meaningful improvements as compared pre-post test (mean of score more than 1.5).

Table (3): Distribution of Study Samples by their Overall of Nurse Knowledge toward Nurses’ knowledge about Action of Facilitated tucking position.

<table>
<thead>
<tr>
<th>Overall assessment for study sample</th>
<th>Pre-test</th>
<th>Post2-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq</td>
<td>%</td>
</tr>
<tr>
<td>Pass</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Fail</td>
<td>25</td>
<td>100</td>
</tr>
</tbody>
</table>

Table (4): Distribution of study sample by their Overall of nurse knowledge toward Nurses’ knowledge concerning Facilitated Tucking Position during Venipuncture

<table>
<thead>
<tr>
<th>Overall assessment for study sample</th>
<th>Post1-test</th>
<th>Post2-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq</td>
<td>%</td>
</tr>
<tr>
<td>Pass</td>
<td>21</td>
<td>84</td>
</tr>
<tr>
<td>Fail</td>
<td>4</td>
<td>16</td>
</tr>
</tbody>
</table>
Regarding subjects of nurses knowledge concerning action of facilitated tucking position, results shows summary statistics such that, frequency, percentage, mean of score, and standard deviation are included for assess responding levels for studied sample either for after applying educational program in first period and after applying educational program in second period for studying questionnaire’s items concerning overall nurses knowledge. Results shows that all of questionnaire’s items in light of this part are assigned meaningful improvements as compared post 1-post2 test (mean of score more than 1.5).

Table (5): Distribution of study sample by their Overall of nurse knowledge toward Nurses’ knowledge concerning Facilitated Tucking Position during Venipuncture

<table>
<thead>
<tr>
<th>Overall assessment for study sample</th>
<th>Pre - Test</th>
<th>Post1 - Test</th>
<th>Post2 - Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Freq</td>
<td>%</td>
<td>M.s.</td>
</tr>
<tr>
<td>Pass</td>
<td>0</td>
<td>0</td>
<td>1.2631</td>
</tr>
<tr>
<td>Fail</td>
<td>25</td>
<td>100</td>
<td>4</td>
</tr>
</tbody>
</table>

F-value(56.522), significance (0.000)

Regarding subjects of nurses knowledge concerning action of facilitated tucking position, results shows summary statistics such that, frequency, percentage, mean of score, and are included for assess responding levels for studied sample either for after applying educational program in pre test and first period and after applying educational program in second period for studying questionnaire’s items concerning overall nurses knowledge. Results shows that all of questionnaire’s items in light of this part are assigned meaningful improvements as compared post 1-post2 test (mean of score more than 1.5) and pre (mean of score less than 1.5).

Table (6): Relationship between the overall assessment of the nurses’ knowledge regarding Facilitated Tucking Position during Venipuncture post2- test and their demographic data
<table>
<thead>
<tr>
<th>Demographic data</th>
<th>Rating</th>
<th>Overall assessment</th>
<th>Chi-square value</th>
<th>d.f</th>
<th>Sign.</th>
<th>C.S</th>
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</thead>
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<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>20 to 25</td>
<td>2</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pass</td>
<td>26 to 31</td>
<td>2</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>32 to 38</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Total</td>
<td>5</td>
<td>20</td>
<td></td>
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<tr>
<td>Level of education</td>
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<td>.104</td>
<td>2</td>
<td>.949</td>
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<td>3</td>
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</tr>
<tr>
<td>College of Nursing and Older</td>
<td>1</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Total</td>
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<td>17</td>
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<tr>
<td>Years of experience in the</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>field of Nursing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
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<td>0</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pass</td>
<td>5 to 9</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>10 to 14</td>
<td>5</td>
<td>20</td>
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<td></td>
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<tr>
<td>Total</td>
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<td></td>
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<tr>
<td>Neonatal intensive care unit</td>
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<tr>
<td>Fall</td>
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<td>3</td>
<td>17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pass</td>
<td>4 to 7</td>
<td>0</td>
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<td></td>
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<tr>
<td>Total</td>
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<td>1</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Total</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>pharmacological methods</td>
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<td></td>
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<tr>
<td>to relief pain during</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>venipuncture</td>
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<td>9</td>
<td></td>
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<td>20</td>
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<td></td>
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<tr>
<td>Can you relief pain for the</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>child during venipuncture</td>
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<td>3</td>
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Results shows that there is no statistical difference between nurses knowledge regarding and their demographic data at $P \geq 0.05$ level.

IV. DISCUSSION

The Sample of The Study Consist of (25) Nurses sex of them simply female this concur with consider (Effectiveness of Health Educational Program upon Nurses’ practices toward Care of Newborns with Neonatal Jaundice). What's more, can't help contradicting think about (Effectiveness of nursing instruction program on medical caretakers information toward Arrhythmia in Kirkuk’s showing doctor’s facilities) According to the investigation test they all attendants female in light of the fact that the legislative issues of clinic made the female medical caretakers working in pediatric, neonatal and maternity unit (9).

Throughout the Course of the example of the present investigation, showed that the greater part 15 (60.0 % ) of Nurses in the examination test were inside age gathering (20 – 25 ). This outcome concur with Ali M F. (2015) consider (Effectiveness of Educational Program on Nurse’s Knowledge Concerning Management of Cardiogenic Shock at AL-Mosul Teaching Hospitals) and can’t help contradicting examine (Effectiveness of nursing training program on attendant’s information toward Arrhythmia in Kirkuk’s instructing healing centers)(10).

As indicated by the investigation test in connection to level of instruction, most medical attendants 15 (60.0%) in the examination test were School (junior nursing). This outcome comparative the investigation directed investigation (Impact of an Educational Program upon Nurses’ Knowledge and Practices Concerning Neurogenic Bladder Rehabilitation for Spinal Cord Injured Persons) who said that the larger part of his examination test were auxiliary nursing school graduates working in neonatal emergency unit there able to work in this units . In connection to the quantity of years of involvement in nursing field, 20(80.0% ) had administration of (1-4 )years in the business ,This outcome comparative the examination directed by (Al-Janabi,2014) in this investigation (Assessment of Nurses’ Knowledge towards Cardiopulmonary Resuscitation at Al-Najaf City’s Teaching Hospital ) said that of his specimen have (<5 ) years of functioning as medical caretakers . In concerning the experience years at neonatal emergency unit 20(80.0%) of medical caretakers had master (1-3) years, this rate of attendants who are work as a medical attendant in neonatal emergency unit to remain in low level of information . In connection with medical caretaker’s information to help torment amid venipuncture by utilizing non-pharmacological technique and the appropriate response (yes or no), the attendants are same level outcome in the two answers (11) (12) (13).

The medical caretakers by what means would relief be able to torment amid venipuncture more than the attendants can’t do that, likewise the other five inquiries subject to this inquiry.

Part I: General information of nurses at neonatal intensive care unit

This section exhibits a deliberately sorted out elucidation and sensibly determined dialog of the outcomes with help of the accessible writing and related examinations.

The Sample of The Study Consist of (25) Nurses sex of them simply female this concur with Suad H. (2016) consider (Effectiveness of Health Educational Program upon Nurses’ practices toward Care of Newborns

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with Neonatal Jaundice). What’s more, can’t help contradicting (Effectiveness of nursing instruction program on medical caretakers information toward Arrhythmia in Kirkuk’s showing doctor’s facilities) According to the investigation test they all attendants female in light of the fact that the legislative issues of clinic made the female medical caretakers working in pediatric, neonatal and maternity unit (10).

Al-Batool Teaching Hospital in diyala City Throughout the Course of the example of the present investigation, showed that the greater part 15 (60.0 % ) of Nurses in the examination test were inside age gathering (20 – 25 ). This outcome concur with Ali M F. (2015) consider (Effectiveness of Educational Program on Nurse’s Knowledge Concerning Management of Cardiogenic Shock at AL-Mosul Teaching Hospitals) and can’t help contradicting examine (Effectiveness of nursing training program on attendant’s information toward Arrhythmia in Kirkuk’s instructing healing centers) (14).

As indicated by the investigation test in connection to level of instruction, most medical attendants 15 (60.0%) in the examination test were School (junior nursing). This outcome comparative the investigation directed investigation (Impact of an Educational Program upon Nurses’ Knowledge and Practices Concerning Neurogenic Bladder Rehabilitation for Spinal Cord Injured Persons) who said that the larger part of his examination test were auxiliary nursing school graduates working in neonatal emergency unit there able to work in this units . In connection to the quantity of years of involvement in nursing field, 20(80.0% ) had administration of (1-4 )years in the business ,This outcome comparative the examination directed by (Al-Janabi,2014) in this investigation (Assessment of Nurses’ Knowledge towards Cardiopulmonary Resuscitation at Al-Najaf City’s Teaching Hospital ) said that of his specimen have (<5 ) years of functioning as medical caretakers (11).

In concerning the experience years at neonatal emergency unit 20(80.0%) of medical caretakers had master (1-3) years, this rate of attendants who are work as a medical attendant in neonatal emergency unit to remain in low level of information . In connection with medical caretaker’s information to help torment amid venipuncture by utilizing non-pharmacological technique and the appropriate response (yes or no), the attendants are same level outcome in the two answers. The medical caretakers by what means would relief be able to torment amid venipuncture more than the attendants can’t do that, likewise the other five inquiries subject to this inquiry.

Part II: Association between nurses’ knowledge and four section that are contain (toward pain, Facilitated Tucking Position, Importance of Facilitated Tucking Position and action of Facilitated Tucking Position) in neonatal intensive care unit among the three period (pre, post-1 and post-2) of an educational program

Twenty sex Items of the survey separated into (104) sub things (supplement D) were utilized to evaluate medical caretakers’ information at neonatal emergency unit. The outcomes demonstrated that the medical attendants’ learning uncovered that their insight at low level before the start of an instructive program and turn out to be abnormal state after first and second follow up of a training program post one and post two. This outcome mirrors that medical attendants’ information is influenced by the instructive program .

The demonstrating the outcome for pre-test, post-test 1 and post-test 2 high noteworthy with questions expect four inquiries likewise critical with other three inquiries .One technique for surveying these frameworks in
blend is the Premature Infant Pain Profile (PIPP). This appraisal instrument perceives torment as a mind boggling, multidimensional wonder among babies conceived preterm. The PIPP measures physiological movement, behavioral state, and facial action. These three components are accept to best reflect difficult encounters of babies conceived preterm. At the point when the PIPP is utilized, target information demonstrate that agony exists in newborn children conceived preterm; in this way, discovering approaches to deal with this torment is basic (Sharon Hill et al 2005).

In Iraq most neonatal medical attendants don’t utilize the Premature Infant Pain Profile (PIPP) to survey torment degree that are ensure our investigation find non critical with question of medical caretaker’s information toward (PIPP) and physiological markers of agony. Venipuncture for blood testing is an every now and again performed excruciating methodology in the NICU, a system whereby the procedure influences the level of torment. One of the favored agony alleviation non-pharmacological ways to deal with torment help would be the utilization of encouraged tucking position (FT). In Iraq, little healing centers are ‘infant agreeable’ and the act of encouraged tucking is accept non-powerful to diminish torment, obviously, we discover the outcome non-huge with attendant’s information being referred to (The Facilitated tucking position is). Via look, we don’t found any program about encouraged tucking position amid venipuncture however other examination was directed semi-test ponder, 70 preterm newborn children conceived at normal 32 to 36 weeks’ Gestational age (GA), who required routine blood gathering, were allotted to two intercession (35 neonates) and control (35 neonates) gatherings.

Its outcome demonstrated that the term of crying in the wake of examining in the two gatherings was factually huge contrast, this length in control amass was higher than the mediation gathering (P<0.05).

Johnston et al. 2011 inferred that the impacts of encouraged tucking have been analyzed in both preterm and extremely preterm newborn children experiencing ordinarily performed tissue softening strategies up the NICU and have been appeared to decrease the extent of physiological and behavioral agony reaction.

Part III: Association between Facilitated tucking position Nurses’ knowledge and their General Information

Association between nurses’ knowledge and their age

Association between nurses’ knowledge and their level of education

The discoveries demonstrate that there was no measurable noteworthy relationship between medical attendants’ learning and their instruction level (p>0.05). The consequences of this investigation contrasted with Zaid W. Ahjil, (2012). The discoveries demonstrated a factual huge relationship between medical attendants’ instruction level and their insight.

Association between nurses’ knowledge with their years of experience in nursing field

The discoveries demonstrate that there was no factual critical relationship between attendants’ information and their times of involvement with nursing field (p>0.05) upheld this outcome. Their discoveries demonstrate no distinction of experience.

Association between nurses’ knowledge and their years of experience at Neonatal intensive care unit

The finding uncovered that there was no measurable noteworthy relationship between attendants’ information and their times of involvement with neonatal emergency unit. This outcome concurs with Fatima H.
(2013) and couldn’t help contradicting study that their investigations indicate measurable critical relationship between attendants’ learning and their times of involvement with attendants who work in the heart therapeutic ward.

The last piece of that are indicating medical attendants learning about non-pharmacological strategy to alleviation torment amid venipuncture and the appropriate responses (yes or no), likewise no critical. The other inquiry that are worried with capacity of medical attendants to utilizing the strategies amid venipuncture and result high critical with attendants who can utilizing techniques to alleviation torment additionally worthy with other examination. In the event that yes what the techniques? Five technique there are medical attendants browsed the strategies, statically critical with (Pharmacological techniques, encouraging tucking position, Breast bolstering and other) however non-noteworthy with music (16) (17) (18).

V. CONCLUSIONS

The study sample only female. More than half of study sample were age (20-25) years. Most of the study sample were Junior Nursing graduate. Majority of the study sample had (1-4) years at nursing field. Most of the study sample had (1-4) years of the experience at neonatal intensive care unit. More than half of study sample can relief pain for child during venipuncture. Most of the study sample cannot use facilitated tucking position to relief pain before conducted program. There was measurable noteworthy relationship between medical attendants’ learning of a training program pre test, post (1) and post (2) the instruction program impact on medical caretakers’ information. The investigation affirmed that there was a high learning level among medical caretakers at neonatal emergency unit encouraged tucking position in post instructive program while low-level information at pre apply program. There was no measurable huge relationship between attendants’ learning and their general data (age, level of training, years of experience, years of involvement in neonatal emergency unit) there is statistical significant association between their general information related to (Ability to relief pain for child during venipuncture, pharmacological method, facilitated tucking position, breast feeding and other) at the post test.

VI. RECOMMENDATIONS

Inordinate emphasis had better be directed toward the educational aspects at neonatal intensive care unit by providing educational posters, guidelines, pamphlets and manuals. Neonatal nurses should initiate policy to providing a special educational session for using non-pharmacological methods to relief pain. Encourage the nurses to use facilitated tucking position during venipuncture. Modern educational facilities for neonatal nurses at neonatal intensive care unit should be provided to enhance nurses’ knowledge. It is necessary to initiate lectures of non-pharmacological care for neonate during nursing colleges and institutes. Applying global educational standards to promote nurses knowledge toward facilitated tucking position. Applying facilitated tucking position in primary health care during HIV vaccination. Conduct study for this procedure on the field directly on the neonate and using appropriate pain scale.
REFERENCES


Stress Intensity Factor Estimation for Straight Base Component of Two Dimensions

Siddharth Bhaduria

Abstract

Failure in industrial term is known as not to perform the intended or desired work. For a design engineer it is very important that a part does perform its intended job efficiently and more reliably. In nuclear power plant there are various pipe lines which carries pressurized fluid and with time under certain conditions these repeated and cyclic loads can cause a fracture inside the pipe wall. Design engineer has to ensure that condition like this doesn’t occur frequently because there are so much at the stake. Now these fracture will occur because of the constantly repeating cyclic loads but measuring the extent to which a pipe can function properly can make a very big difference. System level computer modeling of complex nuclear system is increasingly becoming trend due to availability of advanced computer programs and multi processor based parallel computing hardware and software[1]. Computer based fracture analysis helps in mechanics of the material and computing the different area of the fracture growth. The present level FEA code also allows determination of other field variable. Furthermore, advances in FEA tools for 3-D fracture mechanics and crack propagation allow accurate prediction of the structural integrity of reactor components under severe accident conditions in reactor pressure vessels and other primary pressure boundary components. Most of the literature on fatigue modelling has focused on improving the stress-life data and related empirical fatigue design curves [2] for estimating fatigue life given the stress/strain state of a reactor component. A few studies [3] have emphasized the more mechanistic aspects of fatigue life prediction. For predicting fatigue life estimation it is necessary to understand the crack growth mechanism. Studies related to the crack propagation at constant amplitude loading in cyclically loaded structure is hardly found in most practical applications, though there are some studies done over constant amplitude loading like Paris equation[4] and Forman/Mettu[5].

Keywords; nuclear power plant, stress intensity factor (SIF), austenitic stainless steel (ASS), LEFM, fatigue life, Paris law

1. Introduction

Because of the high end mechanical property of ASS, it is widely used as a nuclear power plant component. But there are many high tensile residual stresses in it,which causes crack [6]. In any NPP it is considered that pressure distribution inside the pipe component is uniformly distributed but we cannot say that it actually happens inside the component. There occur so many stresses and variable load which causes residual stress to grow over there and make a crack tip which is actually caused by the SIF. This crack tip with increasing time propagates the crack formation and from the occurring of the crack to the total fracture in the surface of the component is called as fatigue failure. These fatigue failure are very harmful not only for us human lives but also for the environmental condition apart from that it also causes loss of money and lives of the employee and people living around the plant. In any NPP it is very important to ensure the safety of the employee of that plant and also the environment that’s why every component of the nuclear power plant should be checked on the regular basis because components of the NPP often undergoes various type of load which causes residual stresses on the surface of the pipes. These pipes are often welded at certain cross sections. Now the properties welded part differs from the parent metal to certain extent. Here we are trying to elaborate a review regarding the effect of residual stresses and SIF on the pressurised weld base component.

Recent researches has said that because of thermal ageing embrittlement it tend to lose toughness [7,8,9]. Now from time to time these component must be checked and inspected but this takes a lot of time, resources, workers and more importantly money. However due to the inherent complexity of the welding there is a significant difference between the reading by analyst and FFS codes the effect of residual stresses on the weld
should be evaluated rigorously before thermal ageing take place. Apart from previous reasons because of the stress concentration life of the welded joint decreases [10]. This stress concentration is maximum at weld toes and weld root because of the variation of the shape of weld. Hence for finding the fatigue life of such structures evaluation of stress intensity factor is very important. For measuring the fatigue life it is really important to understand the linear elastic fatigue mechanism because it actually helps us in measuring the fatigue life of any component. For doing that we need to find many constraint like residual stresses which eventually lead us to stress intensity factor, expression for the fatigue crack growth rate and finally initial and final crack size. Paris law creates a relationship between crack growth rate and SIF. Nowadays notch stress intensity factor which also is an extension of the stress intensity factor which allow us to know the stress intensity field at the surface of the component

1.1 Fatigue

Fatigue is one of the principal modes of failure to be considered in the design of components and structures subjected to repetitive types of loads, e.g. Automobile components, railway track components and rolling stock bridges. Offshore structures, ships pressure vessels, handling equipment like cranes, excavators and pipelines, aircraft and space structures are some of the components/structures, which are generally subjected to repetitive loads during their lifetime [11, 12]. The crack growth study, one should consider all the possible crack growth mechanisms such as corrosion, erosion, fatigue, creep, flow induced vibration etc [13,14,15]. Whichever may be operative for the particular heavy water reactor (HWR), Primary heat transport (PHT) piping systems, fatigue is the only crack growth mechanism which cannot be totally ruled out. In materials science, fatigue is the weakening of a material caused by repeatedly applied loads. It is the progressive and localized structural damage that occurs when a material is subjected to cyclic loading. The nominal maximum stress values that cause such damage may be much less than the strength of the material typically quoted as the ultimate tensile stress limit, or the yield stress limit.

Fatigue occurs when a material is subjected to repeat loading and unloading. If the loads are above a certain limit, microscopic cracks will begin to form at the stress concentrated area or point such as the surface, persistent slip bands (PSBs), interfaces of constituents in the case of composites, and grain interfaces in the case of metals. Hence a crack will reach a critical size where the crack will propagate suddenly and the structure will fracture. The shape of the structure significantly affects the fatigue life, square holes or sharp corners will lead to elevated local stresses where fatigue cracks can initiate. Round holes and smooth transitions or fillets will therefore increase the fatigue strength of the structure.

Process of completely failing of the mechanical component can be divided into three stages

1. During a large number of cycles, the damage develops on the microscopic level and grows until a macroscopic crack is formed.
2. The macroscopic crack grows for each cycle until it reaches a critical length.
3. The cracked component breaks because it can no longer sustain the peak load.

The second process in certain components happen really fast so all we can see a crack moving with a rapid pace. The detailed knowledge about the last two stages can be found in fracture mechanics, fatigue mainly applies to the first stage rest of the two stages are mainly for the failure and the mechanics related to it.

Under the influence of a non constant external load, the state in the material also varies with time. The state at a point in the material can be described by many different variables such as stress, strain, or energy dissipation. The fatigue process is typically viewed as controlled by a specific such variable. A load cycle is defined as the duration from one peak in the studied variable to the next peak. In a general case, all cycles do not have the same amplitude. For a superficial discussion, it can, however, be assumed that the fatigue-controlling state variable has the same value at the start and end of each load cycle. In elastic materials, a cyclic load causes a periodic-cyclic stress response. For such cases, the load cycle is easily defined. This is illustrated by the figure below, where stress is the fatigue-controlling state variable.
The stress varies between a maximum stress, $\sigma_{\text{max}}$, and a minimum stress, $\sigma_{\text{min}}$, during a load cycle. In the field of fatigue, the variation in stress is often defined using the stress amplitude, $\sigma_a$, and the mean stress, $\sigma_{\text{m}}$. Further, variables defining the stress range, $\Delta\sigma$, and the $R$-value are frequently used to describe a stress cycle. The relation between the different fatigue stress variables is

$$\sigma_{\text{m}} = \frac{\sigma_{\text{max}} + \sigma_{\text{min}}}{2}$$

$$\sigma_a = \frac{\sigma_{\text{max}} - \sigma_{\text{min}}}{2}$$

$$\Delta\sigma = \sigma_{\text{max}} - \sigma_{\text{min}}$$

$$R = \frac{\sigma_{\text{max}}}{\sigma_{\text{min}}}$$

1.2. Stress Intensity Factor (S.I.F)

As one can perceive through many mechanical failures occurring nowadays it can be said that these failure occurs because of the propagation of fatigue crack frequently in many structures and component. For instance Chernobyl Disaster in 1986. Prediction of fatigue life is very important for supporting frame of wind turbines, offshore machineries, nuclear reactor where high cycle major fatigue is concern. Welding is very convenient and inexpensive way of joining two or more different components in such kind of facility. With the rapid development in the industry and our never ending hunger for energy nuclear power plants have came into existence. These plant though very efficient in terms of producing electricity carries risk of failing which has been explained earlier. Therefore taking full care of the power plant and its component has to be a main concern of any design engineer and with rapid development of the latter, its components are now given more and more attention.

Now as we have discussed earlier about the effect on the welded joint in a nuclear power plant we can say that at many cross sections there is a chance of welding of two dissimilar metal which causes us to show different material properties in the Heat Affected Zone. In this heat affected zone because of non linear temperature distribution and coefficient of thermal expansion there occur some residual stresses in heat affected zone. These residual stresses actually propagates the crack propagation and stresses at the crack tip is called as Stress Intensity Factors. For problems related to crack, Paris law is actually used for evaluating crack growth. However Paris law is actually based upon LEFM approach which helps in evaluating the crack growth and fatigue life does not contributes in the evaluation of SIF accurately [24]. Hence use of FEA has been introduced nowadays. As 2-dimensional modeling in FEA is easier and hence less accurate that’s why use of 2D modeling
for a pressurized base weld component (PBWC) is restricted. 3-Dimensional modeling is used for the PBWC because of the kind of the structure PBWC possess. A pipe is a 3D model of a cylinder. We are not making analysis on a 2D projection of a cylindrical pipe. Though 3D modeling is tough and time taking, it gives accurate and best result according to the problem formulated.

FEM requires special techniques and nowadays for saving time people are using the hybrid between between 2D and 3D model. Though conditioned based maintenance system are in trend in any nuclear power plant but still a more accurate working systems and software are still needed as it does not tell us the information regarding the fatigue failure and crack propagation accurately. Apart from that these softwares are the kind of software which works according to the specific set of plan, the do not self analyze the condition and tell the operator the assessment of the situation regarding the components in the nuclear power plant or in any thermal power plant. Also crack propagation actually takes place at the surface of the pipes as the fluid flows through it at very high speed and temperature which causes repetitive fluctuating loads over the surface of the pipe. Thus pipe after some time start showing the sign of fracture. It is same as when gunshot is fired through a barrel though the fluid does not flows through It as fast as a bullet but then again it actually flows through it with some speed at very high temperature leaving the pipe in a very bad position. Hence it was proposed to increase the allowable pressure of the cylindrical pipe component so as to increase the pipe’s life cycle. This phenomenon is same as a autofrettage which tends to take place in the gun barrel. It was first discovered by the Jacob of the French artillery in 1907. He said that the allowable pressure of the gun barrel must be increased so that shot can be fired to a great distance.

Here our aim is not to fire the fluid to great distance but to minimize the residual stresses at the surface of the pipe. And this is the normal ASS pipe we are talking about not the welded joint between the cross section of a pipe. Where because of the coefficient of expansion residual stress emerge. And it has been proved before that these residual stresses actually influence the crack propagation. Beside even if we increase the size of the cylindrical pipe component or any other component it will take more space which is not useful and not ideal already. For design engineer using of the floor space area efficiently is very important as it reduces the cost of the transportation. Nowadays autofrettage has been developed further for producing better result not only in the field of weaponry but also in the field of cylindrical pressure vessel.

We know pressure vessels is also a kind of a cylinder but a close one from both of the ends. Cylindrical pipes however are open in both the direction to facilitate the flow of fluid in a nuclear power plant. Therefore these cylindrical structures are called as thin walled structures. Therefore crack initiation actually takes place in the radial direction or axial direction because of the hoop stresses being larger in magnitude in that direction. The structural integrity is actually based upon the Stress Intensity Factor in order to bring out the crack growth and its life cycle hence it is really important to perform the proper FEA test on it in order to get the accurate result. In the calculation of stress intensity factor various parameters should be calculated like S.Suresh et al.[16] explained the need of calculating the geometry correction factor for the purpose of better accuracy in result. However most of the results are limited to the Mode-I of the failure which is the tensile stresses normal to the surface of the specimen. Mode II and Mode III of the failure have been neglected by most of the researches because of the hard and time taking calculation of the FEA experiment. Calculation of Stress intensity factor works best under high constraints because if not this may lead to the deviation of the crack tip from the SSY solution hence a high constraint SIF would lead to a better and accurate result for the purpose of evaluating of the fatigue crack life[26]

2. Terminology and Methodology

Two kinds of fatigue loads are encountered

- Constant amplitude load
- Variable amplitude load

Load on a locomotive axle is of constant amplitude whereas fluctuating wind loads on a wing of an aircraft is of variable amplitude. In certain cases both type of loads can be super imposed on the component.

For the constant amplitude fatigue load the terminology has been explained above. However, for variable amplitude load the terminology is as follows

\[ K_{max} = f(\alpha/w)\sigma_{max}(\pi a)^{1/2} \]
\[ K_{max} = f(\alpha/w)\sigma_{min}(\pi a)^{1/2} \]

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Where \( f(\alpha/w) \) is the geometric factor for crack length \( a \) and component width \( w \) in most of the cases, dependence of \( f(\alpha/w) \) on crack length \( a \) is of secondary nature as of the \((a)^{1/2}\) dependence. Some designer prefer not to consider variation of \( f(\alpha/w) \) to keep the calculation simple. The difference of the \( K_{\text{max}} \) and \( K_{\text{min}} \) is an important parameter for determining crack growth and is oftenly described as

\[
\Delta K = K_{\text{max}} - K_{\text{min}}
\]

Another parameter ratio \( R \) is also used and defined as

\[
R = \frac{\sigma_{\text{max}}}{\sigma_{\text{min}}}
\]

There are three categories of \( R \), positive, zero and negative as shown in the below figure. Positive \( R \) is tension-tension fatigue whereas \( R \) negative is represented as tension-compression fatigue.

For negative stress ratio, compressive stress loading is not likely to grow the crack and therefore some investigators treat this case as the one having \( R=0 \). However in sophisticated analysis \( R=0 \) and \( R<0 \) be treated differently. A fatigue crack may be initiated at an existing notch, an inclusions or a surface. It has been usually observed that initiation requires a large number of load cycles. Once the crack is initiated it grows by some distance in every cycle initially with extremely small growth per cycle. As the crack starts becoming longer, the rate of propagation per load cycle, \( da/dn \), also increases. Obviously very small cracks cannot be detected by available not distructive test techniques. No. Of cycles consumed to initiated the crack and then grow it to a smallest possible detectable length is known as initiation life \( N_i \). The detectable crack in most cases still very much sub critical and needs to be grown further under the fatigue loads. No. Of cycles required to grow the smallest detectable crack to the critical size is known as propagation life \( N_p \), thus, the total life becomes

\[
N = N_i + N_p
\]

3. Experimentation and result

Experimented model of a Al6061 plate

This is the meshed model of the Al6061 with the boundary conditions applied as it can be seen from the figure.
at different depths the stress intensity factors of the given model is as follows

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<tr>
<td>14.225</td>
<td>0</td>
<td>40178</td>
<td>127071</td>
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<tr>
<td>15.171</td>
<td>0</td>
<td>37984</td>
<td>165055</td>
</tr>
<tr>
<td>15.654</td>
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<td>33655</td>
<td>198710</td>
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<tr>
<td>16.10013</td>
<td>0</td>
<td>27569</td>
<td>226279</td>
</tr>
</tbody>
</table>

Here $dN$ shows the number of cycles after which it fails

4. Result and conclusion

Here we conclude that stress intensity factor helps us in finding the fatigue life of the material before which it fails. This work also concludes that it is needed more and more material to understand the basic nature of the stress intensity on the different material and under different circumstances.

5. References

[1] Chen et al., 2014a; Qian and Niffenegger, 2013a,b, 2015; Keimet al., 2001; González-Albuixech et al., 2014.


[3] Kalnins et al., 2015; Rudolph et al., 2011; Gilman et al.,2015; Shit et al., 2013; Yun and Shang, 2011; Pirondi and Bonora,2003; Chakerlou and Ajri, 2013


[10] Punit Arora et al 'fatigue crack growth behaviour in pipes and elbows of carbon steel and stainless steel materials'


[24] Kalnins et al., 2015; Rudolph et al., 2011; Gilman et al., 2015; Shit et al., 2013; Yun and Shang, 2011; Pirondi and Bonora, 2003; ChakerLou and Ajri, 2013
Antibacterial Activity Of Seaweed (Gymnogongrus sp) Extract Against Salmonella typhimurium, Escherichia coli and Bacillus subtilis

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Abstract: Seaweed Gymnogongrus sp is endemic to the Maluku region, with the local name "vegetable coral" which usually begins to grow early in the east (April) season along the south coast of Ambon island (Hutumuri - Mahia) and is harvested from July to September. People usually consume them as side dishes. Seaweed can be explored as a natural preservative. In order to preserve fresh food business, especially fish in a sustainable manner using natural preservatives containing bioactive components as antibacterial. To obtain the content of organic compounds from dried plants is to extract the continuous connecting powder of the starting material using a hexane solvent series of solvents alternately, ranging from lowest to highest polarity level or from non polar (Hexane) to produce hexane 1, semi polar extract (Ethyl acetate ) to polar (Methanol). In this study also tried the opposite of polar, semi polar and non polar yielding hexane 2 extract. In this study hexane 1 and hexane 2 extracts are used as test extracts. The purpose of this research is to know the rendement and power of antibacterial of hexane extract from seaweed vegetable type Gymnogongrus sp. The results showed that the yield of hexane 1 extract (0.149%) was higher than hexane 2 extract (0.108%). The antibacterial power to Escherichia coli, Salmonella thypi and Bacillus subtilis from n-hexane 2 extracts is, 42.33; 37.50 and 20.83 mm better when compared with n- hexane 1 extract and control (DMSO) with the result of drag zone diameter respectively: 26.00; 39.33 and 20.17 mm and 11.00; 19.50 and 13.00 mm.

Keywords: Antibacterial activity, Gymnogongrus sp extract, inhibition zone

I. INTRODUCTION

Promotion of the use of natural compounds against foodborne pathogenic microorganisms continues to be done because of consumer perceptions of the most negative chemical preservatives (Reddy et al., 2013;[1] Sant’Ana et al 2014[2]; Mohammed and Omer, 2015)[3]. Seaweeds that have bioactive components as antibacterials should be explored for further study developed for food purposes. Seaweed can preserve food because like other natural ingredients contain phenolics that can preserve food (Abd Elgadir, 2015)[4].

The discovery of antibacterial bioactive compounds from seaweed is a new hope for the community, in response to some people's concerns about antibiotics and preservatives derived from synthetic chemicals. The presence of side effects such as cancer, environmental destruction and disease resistance by these chemicals led to research to explore bioactive compounds in the field of herbs, especially from the sea, especially seaweed as an alternative food preservatives and treatment continues to grow. Extracts of natural ingredients contain phytochemical compounds such as phenol, tannin, steroids, terpenoids, and alkaloids. Brown seaweed as Gram antibacterial (-), Gram (+), pathogens and food decomposition (Kolanjinathan et al, 2009)[5]; Pereira, et al., (2011)[6] reported isolation of epitaondiol monoacetic compounds, stypotriol triacetate and stypodiol from brown seaweed Stypopodium flabelliforme can inhibit the activity of Staphylococcus aureus bacteria, Salmonella typhimurium, Proteus mirabilis, Bacillus cereus, Enterococcus faecalis and Micrococcus luteus.

Solvent selection becomes an important factor in the exploration of natural materials, because each type of solvent has different anti-bacterial capabilities. Dubber and Harder (2008)[7] found that methanol extract from Ceramium rubrum seaweed had higher inhibitory effect than non polar n-hexane extract, while contradictory was found Hellio et al., (2001)[8] where non-polar solvent had antibacterial power highest on seaweed of the same type but different place. This shows that not only the type of solvent but the geographical location of the growth of seaweed also determines the antibacterial power of the natural ingredients.

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Seaweed species (Gymnogongrus sp.) classified as red algae (Rhodopytha) are endemic to the Maluku region that usually grows annually in the early east (April) season along the south coast of Ambon Island (Hutumuri - Mahia) and are usually harvested from the moon July – September. During this time people usually consume as a side dish and more sold (Moniharapon, 1984)[9]. Sormin (2012)[10], reported that seaweed extract Porphyra marcosii also grouped red algae that grow at the same time and habitat with Gymnogongrus sp. able to inhibit the growth of Escherichia coli bacteria. Staphylococcus aureus, and Salmonella typhi.

The objective of this research was to know therendement and antibacterial power of n-hexan extract from coral-type seaweed (Gymnogongrus sp.) To 3 test bacteria Escherichia coli (Gram negative), and Bacillus subtilis (Gram positive, destroyer/decomposition).

II. RESEARCH METHODS

Sample Preparation of Seaweed Vegetable Coral Gymnogongrus sp.

Seaweeds of coral vegetation (Gymnogongrus sp.) Are collected in the village of Hutumuri and Mahia hamlet of Urimesing village of Ambon city. Furthermore, before drying is washed with clean water. Drying is done by drying on a wire screen for 3-4 days. Seaweeds of dried coral species (Gymnogongrus sp.) Are weighed and stored for extracts. The chemical composition of the wet and dry vegetable seaweeds (Gymnogongrus sp.) Is presented in Table 1.

<table>
<thead>
<tr>
<th>Chemical Composition</th>
<th>Wet (%)</th>
<th>Dry (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water content (%)</td>
<td>87.54</td>
<td>27.26</td>
</tr>
<tr>
<td>Protein levels (%)</td>
<td>2.10</td>
<td>5.31</td>
</tr>
<tr>
<td>Fat level (%)</td>
<td>0.24</td>
<td>0.42</td>
</tr>
<tr>
<td>Ash Content (%)</td>
<td>3.52</td>
<td>10.50</td>
</tr>
<tr>
<td>Carbohydrate levels</td>
<td>6.60</td>
<td>56.51</td>
</tr>
</tbody>
</table>

Extract Preparation

Seaweeds of coral vegetation (Gymnogongrus sp.) Are collected in the village of Hutumuri and Mahia hamlet of Urimesing village of Ambon city. Furthermore, before drying is washed with clean water. Drying is done by drying on a wire screen for 3-4 days. A total of 750 g of dried seaweed was extracted (maseration method) with 2,500 ml of hexane for 2 days (48 hours). The resulting filtrate was evaporated with a rotary evapotor vacuum resulting in hexane 1 extract (Dubber and Harder (2008)[7] and 750 g were extracted, respectively: with 2,500 ml of methanol for 2 days and the resulting residue was macerated again with 2,500 ml of ethyl acetate for 2 days and then the resulting residue was extracted again with 2,500 ml of hexane for 2 days and the resulting filtrate was evaporated with a vacuum evapotor rotary resulting in a hexane 2 extract (Modified method of Himejima and Kubo, 1991)[11].

Determination of Rendement

Calculation of the value of rendement is the weight ratio of the commodities taken / obtained with the intact weight of the commodity raw materials multiplied by 100% (Nurjanah et al., 2004)[12].

Antibacterial Test

The antibacterial test was carried out by a 2-layer (bilayer) method of the medium according to Balaouri et al., (2016)[13]. The following procedure: The sterilized medium is silenced for several minutes and pour it into 15 ml sterile petri and leave it to medium dry and solid. Prepare media mixed with bacterial media culture bacteria (Escherichia coli, Salmonella thyphi and Bacillus subtilis) with cell number 107, then poured on the top of the first layer of the media and leave to dry and solid. Make a well (hole) on the surface of the media with a diameter of 6 mm, then drop 40 μl of each solution extract into the pit and 40 μl DMSO 10% sterile as a negative control. Subsequently the media was incubated in the incubator at 37 ° C for 24 hours. Observe and measure the diameter of the clear zone (mm) formed around the wellbore. The diameter of the inhibit zone is the diameter of the resulting size minus 6 mm.
Data analysis using Completely Randomized Design (RAL) Factorial pattern with 3 (three) (Gasperzs, 1994)[14].

III. RESULT AND DISCUSSION

Rendement Gymnogongrus sp. Extract

Result of extraction with maseration method to 750 g seaweed Gymnogongrus sp. dried obtained hexane extracts were 1.12 g and 0.81 g, respectively. From the results of this extract then obtained rendement extract of raw materials in the form of dried seaweed as shown in Table 2 below.

Table 2. Rendement extract of seaweed Gymnogongrus sp

<table>
<thead>
<tr>
<th>Extract of seaweed</th>
<th>Rendement (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hexane 1</td>
<td>0.149</td>
</tr>
<tr>
<td>Hexane 2</td>
<td>0.108</td>
</tr>
</tbody>
</table>

To obtain the content of organic compounds from dried plants is to extract continuous connections of powdered starting material using a series of solvents alternately, ranging from lowest to highest polarity level or from non polar to polar. This is also done by Dubber and Harder (2008)[7], where they do so by using n-hexane solvent and then methanol on seaweed type Mastocarpus stellatus, Laminaria digitata and Ceramium rubrum.

Rendement results of hexane 1 extract (first extracted) from seaweed type Gymnogongrus sp. as shown in Table 1 was larger when compared with extracted hexane 2 extracts after extracting with methanol (extracts obtained 138.58 g or yield of 18.477%) and ethyl acetate (extracts obtained 5.59 g or yield of 0.745 %). The yield of Table 1 shows that Hexan 1 extract 0.149% is slightly higher and the hexane 2 extract is slightly lower than Sormin (2012)[10] reported that the yield of hexane extract from Porphyra marcosii seaweed is 0.125%. It is understandable that although these two seaweeds are grouped red algae that grow at the same time and habitat, but the shape of Gymnogongrus sp. is a thalus while Porphyra marcosii is leaf-shaped.

Antibacterial Activity Seed Hexan Extracts Gymnogongrus sp.

Based on the result of statistical analysis, two way anova test showed that bacterial type factor and extract type factor and interaction between bacterial factor with seaweed extract factor had highly significant effect on antibacterial power (drag zone) with significance value <α (<0,01). Furthermore, the results of the test of Bright Differences (BNJ) type of bacteria, types of extracts and bacteria type interaction treatment and the type of extract as listed in Tables 3, 4 and 5.

Table 3. BNJ Test Results Differences in Bacterial Type

<table>
<thead>
<tr>
<th>Type of bacteria</th>
<th>Average inhibit zone (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escherichia coli</td>
<td>26.44b</td>
</tr>
<tr>
<td>Salmonella thypi</td>
<td>32.11a</td>
</tr>
<tr>
<td>Bacillus subtilis</td>
<td>18.00c</td>
</tr>
</tbody>
</table>

Information:
The numbers in the notation columns followed by different letters (a, b, and c) show a significant difference in (sig <0.01).

Table 4. BNJ Test Results Differences Extract Type

<table>
<thead>
<tr>
<th>Types of extracts</th>
<th>Average inhibit zone (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>n-hexane 1</td>
<td>28.50b</td>
</tr>
<tr>
<td>n-hexane 2</td>
<td>33.55a</td>
</tr>
<tr>
<td>control</td>
<td>14.50c</td>
</tr>
</tbody>
</table>

Information:
The numbers in the inhibition diameter columns followed by different letters (a, b, and c) show a significant difference in (sig <0.01).
Table 5. BNJ Test Results of Treatment Interaction Type of Bacteria and Type of Extract of Seaweed Gymnogongrus sp.

<table>
<thead>
<tr>
<th>Type of bacteria</th>
<th>Types of extracts (500μg)</th>
<th>Average inhibit zone (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n-heksan 1</td>
<td>26.00b</td>
</tr>
<tr>
<td></td>
<td>n-heksan 2</td>
<td>42.33a</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>11.00d</td>
</tr>
<tr>
<td>Salmonella thypi</td>
<td>n-heksan 1</td>
<td>39.33a</td>
</tr>
<tr>
<td></td>
<td>n-heksan 2</td>
<td>37.50a</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>19.50c</td>
</tr>
<tr>
<td>Bacillus subtilis</td>
<td>n-heksan 1</td>
<td>20.17c</td>
</tr>
<tr>
<td></td>
<td>n-heksan 2</td>
<td>20.83bc</td>
</tr>
<tr>
<td></td>
<td>control</td>
<td>13.00d</td>
</tr>
</tbody>
</table>

Information:
The numbers in the inhibition diameter columns followed by different letters (a, b, c, d, e, and f) show significant differences at (p <0.01).

From Table 3 it turns out that the hexane extract of seaweed Gymnogongrus sp. has the highest ability to inhibit the growth of Salmonella thypi bacteria (Gram negative, pathogen) with inhibit zone 32.11 mm, followed by Escherichia coli (Gram negative, sanitation indicator and also pathogen) 26.44 mm and Bacillus subtilis (Gram positive) equal to 18.00 mm. This is due to the fact that peptidoglycans of Gram positive bacteria are thicker than Gram-negative bacteria (Fardiaz, 1992)[15], so that the active extracts of the Gymnogongrus sp. more easily penetrate the cell wall of Gram negative bacteria. Apparently this is also appropriate but much larger than the report Sormin (2012)[10] that the inhibited bacteria inhibited methanol extract, ethyl acetate and hexane from Porphyra marcosii are Eschericola coli (9,9817 mm), followed by Salmonella thypi (9.5808 mm) and Staphylococcus aureus (7.4708 mm). This result is also much higher when compared to the diameter of inhibitory power of acetone seaweed extract Stoechospermum marginatum of 11 mm (E. coli) of methanol extract to E. coli by 10 mm (Kavalvishi et al., 2012)[16]. Previously Kolanjinatan et al., (2009)[5] reported that ethanol extract from Gracilaria edulis seaweed was able to inhibit E. coli, S. aureus, P. aeruginosa and Streptococcus faecalis. Limo-Filho et al. (2002)[17] suggests bacteria that can be inhibited by Ulva fasciata and Caulerpa cupressoides extracts are Bacillus subtilis, Staphylococcus epidermidis, S. aureus. Oranday et al., (2004)[18] suggested that extracts of seaweed species Ulva lactuca, U. fasciata and Sargassum fluitans are able to inhibit E. coli and S. aureus bacteria. Tuney et al., (2006)[19] reported seaweed species of Ulva rigid, Enteromorpha linza, Padina pavonica, Colpomenia sinuosa, Dictyota linearis and Dictyopteris membranacea capable of inhibiting S. aureus, S. epidermis, P. aeruginosa and E. coli bacteria. Seaweed species of Chaetomorpha lemonade, Enteromorpha compressa dichotoma and Polysiphonia sublissima were able to inhibit Bacillus brevis, Bacillus subtilis, E. coli, Vibrio cholera and Shigella flexneri. Pareia et al. (2011)[6] suggests that seaweed Sympodium flabelliforme able to inhibit bacteria Staphylococcus aureus, Salmonella typhimurium, Proteus mirabilis, Bacillus cereus, Enterococcus faecalis and Micrococcus luteus. Jeyanthi et al., (2013)[20] reported seaweed Gracilaria cortica able to inhibit the bacteria Klebsiella sp. and E. coli respectively 1.5 mm and 1.9 mm and seaweed Enteromorpha flexuosa each 2.5 and 3.7 mm.

Based on further tests (Table 4), the n-hexane 2 extract was significantly different from the n-hexane 1 extract capable of producing the highest inhibit zone of 33.55 mm which was very significant with n-hexane 1 (28.50 mm) and control (14, 50 mm). These results are much higher as reported Sormin (2012)[10] inhibition zone of n-hexane extract, ethyl acetate and methanol from Porphyra marcosii and control respectively are: 6.39; 10.35 and 13.29 mm and 6.01 mm.

The antibacterial power of the two n-heksan extracts of seaweed Gymnogongrus sp. ranging from 20.17 to 42.33 mm is still within the range and higher than the antibacterial power of seaweed extract of Malaysian red alga (Laurencia sp) which ranges from 7 to 30 mm, but in its ability to inhibit the growth of Escherichia coli the seaweed is lower than seaweed Gymnogongrus sp.

When compared with the study of Hellio et al., (2001)[8] then seaweed extract Gymnogongrus sp. has a higher antibacterial inhibitory power where Ceramium ruprum seaweed inhibitory has a resistance range of 5-6 mm. Antimicrobial inhibition of seaweed Gymnogongrus sp. is generally in the range slightly lower and higher when compared with the antibacterial power of land plants such as the leaves and seeds of lotus flower that is 19.33 - 29.57 mm (Fitrial, 2009)[21], while the betel leaf ranges from 10-24 mm ( Suliantri, 2009)[22].

Based on the advanced test (Table 5), the inhibition zone of n-hexane 2 extract to the highest Escherichia coli bacteria was 42.33 mm which was significantly different with all inneractive n-hexane 1 extracts against E. coli with 26.00 mm inhibition zone and control of all test bacteria. Also significantly different from
hexane 2 extract inhibition zone to *Bacillus subtilis* of 20.83 mm and hexane 1 extract against *Bacillus subtilis* that is 20.17 mm. This result is much higher as reported by Sormin (2012)[10], ie zone of n-hexane extract from *Porphyra marcosii* to *E. coli, Salmonella thypi* and *Staphylococcus aureus*: 12.23, 11.61 and 7.20 mm.

From the above explanation, the choice of solvent becomes an important factor in the exploration of natural materials, because each type of solvent has different anti-bacterial capabilities. Dubber and Harder (2008)[7] found that methanol extract from *Ceramium rubrum* seaweed had higher inhibitory effect than non polar n-hexane extract, while contradictory was found Hellio et al., (2001)[8] where non-polar solvent had antibacterial power highest on seaweed of the same type but different place. This shows that not only the type of solvent but the geographical location of the growth of seaweed also determines the antibacterial power of the natural ingredients.

Apparently *Gymnogongrus* seaweed extract from hexane solvent has a very large inhibition zone so it is most able to inhibit the three test bacteria compared to previous research from other researchers related to seaweed. This shows the possibility of non-polar compounds of broad-spectrum *Gymnogongrus* phytochemicals.

**IV. CONCLUSION**

The yield of n-hexane 1 extract was 0.149% higher than the n-hexane 2 extract of 0.108%. The antibacterial power to *Escherichia coli, Salmonella thypimurium* and *Bacillus subtilis* from n-hexane 2 extract is 42.33; 37.50 and 20.83 mm better when compared with n-hexane 1 extract and control (DMSO) with result of drag zone diameter respectively: 26.00; 39.33 and 20.17 mm and 11.00; 19.50 and 13.00 mm. *Gymnogongrus* extract most actively inhibits *Salmonella typhimurium* bacteria.

**REFERENCES**


AUTHORS

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Groundwater Exploration In Parts Of Mangu-Halle North-Central Nigeria.

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Abstract - Geophysical survey using the Vertical Electrical Sounding (VES) technique of investigation was carried out for the determination of groundwater potentials in parts of Mangu-Halle and surrounding areas. The ABEM Terrameter (SAS 1000), precisely the Schlumberger array with \( \frac{AB}{2} \) electrode spread of 1.5m-215m was employed in the data collection. A total of thirty-five (35) VES points were collected. The field data were interpreted using WIN RESIST computer iterative program. The results obtained from the interpretations were illustrated as geo-electric sections and depth to basement maps which revealed 3-4 geo-electric layers. The first layer consists of topsoil / lateritic cap with resistivity values of 123-2908\( \Omega \), the second layer consist of weathered zone with resistivity value of 6.0379\( \Omega \), the third and the fourth layers consists of fractured basement with resistivity from 194-4968\( \Omega \) and possibly aquiferous, promising good quantity of groundwater source; and the fifth layer consists of fresh basement. With reference to the interpretation of data acquired i.e aquifer thickness and material constituents in the subsurface, the area was classified into high, medium and low groundwater potential zones with the sole aim of providing the background information for detailed groundwater exploration and development within the area.

Keywords: Investigation, Geo-electric, Vertical Electrical Sounding, Aquifer

1. INTRODUCTION

The electrical resistivity method is suitably used for groundwater exploration which makes it a well known method that can be successfully employed for groundwater investigations, especially where there is a good contrast in the electrical properties between the saturated and unsaturated sub surface layers[1]. This method is regularly used to solve a wide range of groundwater problems[2,3].

The provision of adequate water supply and sanitation to the rapidly growing urban populations is increasingly becoming a problem for governments throughout the world. Due to the rapid increase in the population growth within the study area and surrounding villages, which resulted to the consequent increase in the demand for potable water supply, this research was carried out in order to explore the possibilities of groundwater supply which is more reliable. The availability of groundwater is therefore, a major asset that can greatly influence agricultural production, domestic use, industrial use etc. improving the growth and sustainability of the area in order to meet the development agenda for Nigeria.

The purpose of this research therefore is to investigate the subsurface using the vertical electrical sounding technique as well as identify the aquiferous zones that could be harnessed for groundwater resources so as to meet the increasing demand.

2. LOCATION AND GEOLOGIC SETTING

The study area is located in north central Nigeria, it lies within latitudes N09\(^{0}\) 30’50” and N09\(^{0}\)31’47” and longitudes E009\(^{0}\)05’17” and E009\(^{0}\)06’13” (Fig. 1) on the Maijuju sheet 169 SW and covers an area extent of about 16km\(^2\) The study area is accessible through Barkin Ladi- Mangu road or the Jos- Bisichi-Korot-Fan-Mangu-Halle road.
The study area is underlain by rocks of the basement complex which forms smooth dome features with gentle slope, and exposures along the river channels. The entire study area is composed of granitic gneisses (Fig 2) which are predominantly medium-grained texture, although some samples showed granoblastic with coarse porphyroblastic texture. The rocks are crystalline, non-porous and therefore a poor source of groundwater unless weathered or fractured.

3. MATERIALS AND METHOD

A total of thirty five (35) VES were acquired using the ABEM terrameter SAS 1000 model. Other accessories attached to the terrameter include a power source, tapes, electrodes (current and potential), cables, clips and hammers. The Schlumberger array configuration was applied to carry out the investigation with an electrode spacing of 1.5m to 215m. The VES stations were sounded randomly within the study area with their corresponding coordinates noted using the Global Positioning System (GPS); these are displayed on figure 2 below.
4. DATA PROCESSING AND INTERPRETATION

Field data obtained were processed and interpreted qualitatively and quantitatively. The qualitative interpretation was the type-curve inspection to discern the layering. Furthermore, the type curves were quantitatively interpreted using computer iterative software (WIN RESIST Program), which were eventually presented in the form of geo-electric sections and maps.

The VES data acquired were plotted as depth sounding curves in terms of apparent resistivity versus AB/2 spread (electrode spacing). The different type-curves were classified based on their characteristics layering as shown in Table 1 below which ranges from 2 to 5 layers. From the VES interpretations 3-5 geo electric layers were delineated in the study area.
Table 1: Summarized Table of the Vertical Electrical Sounding (VES) Locations

<table>
<thead>
<tr>
<th>VES Points</th>
<th>Longitude</th>
<th>Latitude</th>
<th>Elevation (m)</th>
<th>Curves Types</th>
<th>No. Of Layers</th>
<th>Curve Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>P_1</td>
<td>E008.53261</td>
<td>N009.39452</td>
<td>1262</td>
<td>QA</td>
<td>4</td>
<td>P_1&gt;P_2&gt;P_3&gt;P_4</td>
</tr>
<tr>
<td>P_2</td>
<td>E009.09588</td>
<td>N009.52352</td>
<td>1130</td>
<td>HA</td>
<td>3</td>
<td>P_1&gt;P_2&gt;P_3</td>
</tr>
<tr>
<td>P_3</td>
<td>E009.09534</td>
<td>N009.52433</td>
<td>1147</td>
<td>HA</td>
<td>3</td>
<td>P_1&gt;P_2&gt;P_3</td>
</tr>
<tr>
<td>P_4</td>
<td>E009.09490</td>
<td>N009.52513</td>
<td>1141</td>
<td>H</td>
<td>5</td>
<td>P_1&gt;P_2&gt;P_3&lt;P_4&lt;P_5</td>
</tr>
<tr>
<td>P_5</td>
<td>E009.09750</td>
<td>N009.52195</td>
<td>1134</td>
<td>H</td>
<td>3</td>
<td>P_1&gt;P_2&lt;P_3</td>
</tr>
<tr>
<td>P_6</td>
<td>E009.09533</td>
<td>N009.52875</td>
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<td>P_1&gt;P_2&lt;P_3&lt;P_4</td>
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<tr>
<td>P_7</td>
<td>E009.09573</td>
<td>N009.52761</td>
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<td>N009.52651</td>
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<tr>
<td>P_9</td>
<td>E009.09757</td>
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<td>1136</td>
<td>HK</td>
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<td>P_1&gt;P_2&gt;P_3</td>
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<tr>
<td>P_10</td>
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<td>N009.52416</td>
<td>1133</td>
<td>H</td>
<td>3</td>
<td>P_1&gt;P_2&gt;P_3</td>
</tr>
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<td>N009.52034</td>
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<td>P_14</td>
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<td>N009.51898</td>
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<td>N009.51712</td>
<td>1122</td>
<td>QH</td>
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<td>P_1&gt;P_2&lt;P_3&lt;P_4&lt;P_5</td>
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<td>N009.51608</td>
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<td>N009.51705</td>
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<td>N009.51706</td>
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<td>N009.51568</td>
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<td>N009.51685</td>
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<td>N009.51721</td>
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<td>3</td>
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</tr>
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<td>N009.51858</td>
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<td>3</td>
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<td>N009.52141</td>
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<td>N009.51986</td>
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<td>3</td>
<td>P_1&gt;P_2&lt;P_3</td>
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<td>N009.52000</td>
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<td>3</td>
<td>P_1&gt;P_2&lt;P_3</td>
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<td>P_33</td>
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<td>N009.52300</td>
<td>1152</td>
<td>QH</td>
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<td>P_1&gt;P_2</td>
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<tr>
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<td>N009.52416</td>
<td>1133</td>
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<td>3</td>
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<td>N009.52189</td>
<td>1124</td>
<td>H</td>
<td>4</td>
<td>P_1&gt;P_2&lt;P_3&lt;P_4</td>
</tr>
</tbody>
</table>

Furthermore, geo-electric sections were taken along 3 different profiles i.e A-A’, B-B’ and C-C’, as shown on Figures 3a, 3b and 3c below. These section revealed 3-4 major geo-electric layers underlain within the area under investigation. The first layer consists of topsoil/ laterite, the second layer comprises the laterite/weathered basement, the third and the fourth layers consist of fractured basement grading to fresh basement respectively.

The various depth of overburden to fresh basement generated at each VES points were plotted and contoured using the suffer GIS Program as Isopach of overburden thickness (fig. 4), the overburden thickness ranges from 2m- 40m. As a result, the depth to basement maps, geo-electric sections, and lithologic sections reveal factual character about the subsurface which have aided to classify the groundwater potentials within the area as displayed on Fig. 5 below. Thus, he groundwater potential of the study area has been characterized into high, medium, and low water potential zones with the following characteristics:

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i. High groundwater potential zones which are areas with intense and deep weathering/overburden thickness of 28-40m coupled with fractured basement. For this reason, such regions are promising with good quantity of groundwater source.

ii. Medium groundwater potential zones include area with weathering depth from 16-28m and also some fractured basement.

iii. Low groundwater potential zones comprise areas with depth of weathering from 2-16m.

Fig. 3a. Geo-electric section along A-A’ profile

Fig. 3b: Geo-electric section along B-B’ profile

Fig. 3c: Geo-electric along C-C’ profile
Fig. 4: Depth to Basement Map
5. CONCLUSION

The electrical resistivity method of investigation adopted in this study has proven useful in the identification of groundwater potential zones within the study area. High groundwater prospective areas encompass P2, P3, P9, P10, P11, P18, P20, P29 and P30. On the other hand, areas that must be avoided include P6, P12, P13, P14, P15, P17, P32 and P34 because of the low groundwater potential nature of these points. However, areas with moderate groundwater potentials include P1, P4, P5, P7, P8, P16, P19, P21, P22, P23, P24, P25 others are P26, P27, P28, P31 and P33 as illustrated in figure 5 above.

By way of contributing to knowledge, this research has helped characterize the entire study area for future groundwater development which will serve to benefit the inhabitants and Plateau state at large.
REFERENCES


Empowerment of Women Teachers in Relation to Their Family Adjustment

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** Doctoral Research Scholar, Department of Education, Annamalai University. India.

Abstract- The present study was designed to assess the Empowerment and Family Adjustment level of women teacher. Empowerment scale constructed and validated by Sridevi, 2005 and Family Adjustment scale constructed by the Spanier, 1976 was used to collect responses for this study. A total of 500 women teachers, working in private, aided and government schools were randomly selected. The study reveals the fact that the level of Empowerment and Family Adjustment are at high levels. There is low positive and significant correlation is found between women teachers empowerment and family adjustment.

Index Terms- Designation, Educational Qualification, Empowerment, Family Adjustment, Income, Locality of the Institutions, Medium of Instruction, Nature of the Institutions, Service, Subject Taught, Type of Institutions and Working hours.

I. INTRODUCTION

Empowerment of Women

Empowerment has different meaning in different socio-cultural and political context. It has both intrinsic and instrumental values. The conspicuous feature of the term is that it contains within it the word power. It is relevant at the individuals and groups and can be economical, social or political, i.e. the power is exercised by either an individual or a group at economic, social or political level. Empowerment has two important components: it is a power to achieve desired goal but not a power on others; it is relevant to those who are powerless irrespective of gender specific, individual or group. Women's empowerment is a unique as it is gender specific and multidimensional. Women’s empowerment may be defined as a change in the context of women life which enables a more fulfilling human life. This includes both internal and external quantities- Internal quantities: self-awareness and self-confidence; External quantities: health, education, mobility, awareness, status in the family, decision making and also at the material security (Mathew, 2003).

II. FAMILY ADJUSTMENT

Time has changed from the time the husband earned, and the wife stayed at home. To the time now when the husband earns and the wife earns too. But the wife still cooks and washes and runs the house (Lakshmiri and Neena.S 2006). So, how does a woman balance the work with life at home? Although, over the years women in India have struggled to establish an identity and create a mark in the social as well as in the organizational platforms, but with educational institutions training more and more women to enter professional careers, have drastically changed the scenario.

Work-life balance as an intentional state of harmony and wholeness that exists within the seven major life areas (categories) in a person's life: Family, Career, Financial, Social, Health, Personal Development, and Spiritual/Ethical. It is true that many people tend to focus more on their career life area to the detriment of the others - most often the family life area (Saskatchewan Teachers' Federation 2005). Many working mothers, the work life balance is one of life's greatest challenges. While men often feel conflicted between work place and fatherhood demands as well, women usually suffer from more than their fair share of the burden of balancing family and work life.

III. NEED FOR THE STUDY

Every organism wants to use its full potential during their lifetime (Carl Roger). Empowerment of women makes them to excel their inherent abilities in a useful way. The feeling of empowerment helps the advancement of teachers in every aspects of personal and professional life. Family Adjustment is an indicator of empowered woman’s attitude. So the researcher wants to study the Empowerment of Women Teachers In Relation To Their Family Adjustment.

IV. OBJECTIVES OF THE STUDY

1. To find out the level of Empowerment of teachers.
2. To find out the level of Family Adjustment of teachers.
3. To find out whether there is any significant difference between the mean Empowerment and Family Adjustment scores of
   a. Educational Qualification : D.T.E.D./ Under Graduate/ Post Graduate
   b. Nature of the Institutions : Primary school/Middle school/High school/Higher Secondary
   c. Type of Institutions : Government/ Private / Aided
   d. Locality of the Institutions: Rural/ Urban
   e. Income : Rs.5000/ Rs.5001-Rs.10000/ Above 10001 (CHECK)
   f. Medium of Instruction : Tamil/ English

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g. Service : Below 5 years/5-10/ Above 10
h. Working hours : 8/8-10/10-12
i. Subject Taught : Arts/ Science
j. Designation : SGT/ BT/ PG

4. To find out whether there is any significant relationship between empowerment and Family Adjustment of women school teachers.

V. HYPOTHESES OF THE STUDY
1. The level of Empowerment of teachers is high.
2. The level of Family Adjustment of teachers is high.
3. There is no significant difference between the mean Empowerment and Family Adjustment scores of
   a) Educational Qualification : D.T.ED./ Under Graduate/ Post Graduate
   b) Nature of the Institutions : Primary school/Middle school /High school /Higher Secondary
   c) Type of Institutions : Government/ Private / Aided
   d) Locality of the Institutions: Rural/ Urban
   e) Income : Rs.5000/ Rs.5001-Rs.10000/ Above 10001 (CHECK)
   f) Medium of Instruction : Tamil/ English
   g) Service : Below 5 years/5-10/ Above 10

4. There is no significant relationship between Empowerment and Family Adjustment of women school teachers.

VI. METHODOLOGY
In the present study, the investigator adopted the Normative Survey method. The normative survey method describes and interprets what exists at present. The investigator collected data from the Women teachers working in the schools in Cuddalore district of Tamilnadu state. For the data collection, as many as 500 Women teachers were selected by using simple random sampling technique. The sample represents the entire population. Proportionate weightage was given to various sub-samples. The tools, used in this study, include Empowerment scale constructed and validated by Sridevi, 2005 and Family Adjustment scale constructed by the Spanier, 1976.

VII. ANALYSIS AND INTERPRETATION
The researcher used descriptive, differential analysis and correlational analysis to test the hypotheses through IBM SPSS19.

Table 1. Means and SD of the Entire Sample

<table>
<thead>
<tr>
<th>Variables</th>
<th>Means</th>
<th>SDs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empowerment</td>
<td>21.17</td>
<td>1.83</td>
</tr>
<tr>
<td>Family Adjustment</td>
<td>79.84</td>
<td>12.91</td>
</tr>
</tbody>
</table>

From the Table 1 the calculated mean and S.D of empowerment of women school teachers are found to be 21.17 and 1.83 respectively. The mean score for the entire sample is 21.1. Here the minimum score is 18 and maximum score is 24. The mean score is 21.17. As per the obtained score the school teachers have high level of empowerment. The calculated mean scores of the sub samples were ranging from 21.17 and 1.83 which are also above the average level. Hence all the sub samples of the present study have high empowerment. The calculated mean and S.D of family adjustment of women school teachers are found to be 79.84 and 12.91 respectively. It is also inferred that the family adjustment of women school teachers is high.

Table 2
Correlation Co-Efficient (r) between empowerment and family adjustment of women Teachers

<table>
<thead>
<tr>
<th>Variables</th>
<th>N</th>
<th>r value</th>
<th>Remarks</th>
</tr>
</thead>
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<td>Empowerment</td>
<td>500</td>
<td>0.430</td>
<td>Significant at 0.01 level</td>
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<tr>
<td>Family Adjustment</td>
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</table>

It is seen from table – 2 that the correlation co efficient among empowerment and family adjustment of teachers is positive and significant at 0.01 levels.
Table 3
Showing the Mean, Standard Deviation and ANOVA / t- value of Empowerment Scores of Women Teachers

<table>
<thead>
<tr>
<th>S.N o</th>
<th>Samples</th>
<th>Sub Sample</th>
<th>N</th>
<th>Mean</th>
<th>S.D</th>
<th>F/t value</th>
<th>Remarks</th>
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<td>0.104</td>
<td>(NS)</td>
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<td></td>
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<td>U.G. Teachers</td>
<td>97</td>
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<td></td>
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<tr>
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<td></td>
<td>P.G. Teachers</td>
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<td>21.25</td>
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<td>1.60</td>
<td>1.302</td>
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<td>Middle</td>
<td>229</td>
<td>21.19</td>
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<td></td>
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<td>High</td>
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<td>P.G.</td>
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<td>21.25</td>
<td>1.83</td>
<td></td>
<td></td>
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</table>

The details of the calculation are given in the Table 3. The 'F' and 't' value is found to be (0.104, 1.302, 0.003, 0.282, 0.031, 1.249, 1.368 and 0.171) which is not significant at the level. Therefore the null hypothesis is rejected. It is concluded that there is no significant difference between the mean Empowerment scores of Educational Qualification, Nature of Institution, Type of Institution, Income, Service, Working hours, Subjects taught and Designation. So here the null hypothesis is accepted and alternate hypothesis is rejected.

The 't' value is found to be 2.65, which is significant at the 0.01 level. Therefore the null hypothesis is rejected. It is concluded that there is a significant difference between the mean empowerment scores of Rural and Urban teachers. Rural teachers have higher empowerment than the Urban school teachers. Also the table the 't' value is found to be 2.24, which is significant at the level. Therefore the null hypothesis is rejected. It is concluded that there is a significant difference between the mean empowerment scores of Teachers teaching in Tamil and English medium.

Table 4
Showing the Mean, Standard Deviation and ANOVA / t- value of Family Adjustment Women Teachers

<table>
<thead>
<tr>
<th>S.No</th>
<th>Demographic samples</th>
<th>Sub Sample</th>
<th>N</th>
<th>Mean</th>
<th>S.D</th>
<th>F/t value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Educational Qualification</td>
<td>D.T.Ed., Teachers</td>
<td>367</td>
<td>77.28</td>
<td>13.23</td>
<td>18.67</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>U.G. Teachers</td>
<td>97</td>
<td>86.62</td>
<td>4.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>P.G. Teachers</td>
<td>36</td>
<td>75.22</td>
<td>11.98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Nature of Institution</td>
<td>Primary</td>
<td>71</td>
<td>88.07</td>
<td>11.86</td>
<td>235.07</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Middle</td>
<td>229</td>
<td>66.38</td>
<td>9.84</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The details of the calculation are given in the Table 4. The 'F' value is found to be (18.67, 235.07, 12.54, 22.96 which is significant at the 0.01 level. Therefore the null hypothesis is rejected. It is concluded that there is a significant difference between the mean Family adjustment scores of Educational Qualification, Nature of Institution, Service and Working hours. The 't' value is found to be (5.12 and 7.631) which is significant at the 0.01 level. Therefore the null hypothesis is accepted. It is concluded that there is a significant difference between the mean family adjustment scores of Rural and Urban teachers. Rural teachers have better family adjustment than the Urban school teachers. Also it is concluded that there is significant difference between the mean family adjustment scores of Arts and Science teachers. The 'F' and 't' value is found to be 0.413, 2.03, 1.40  and 1.22, which is not significant at the level. Therefore the null hypothesis is accepted. It is concluded that there is no significant difference between the mean family adjustment scores of Type of Institution, income, medium and Designation.

VIII. FINDINGS OF THE STUDY

- There is there is a significant difference between the mean empowerment scores of Rural and Urban teachers. Rural teachers have higher empowerment than the Urban school teachers.
- There is no significant difference between the mean empowerment scores of teachers having below 5 years, 5-10 years and above 10 years of service.
- There is no significant difference between the mean empowerment scores of teachers whose work load is 8 hours, 8-10 hours and 10-12 hours.
- There is no significant difference between the mean empowerment scores of Arts and Science teachers. Arts group have better empowerment than Science group.
- There is no significant difference between the mean empowerment scores of SGT, UG and PG teachers.
- There is a significant difference between the mean Family adjustment scores of D.Ed., U.G. and P.G. teachers. U.G. Teachers have better adjustment than the other groups.
- There is a significant difference between the mean Family adjustment scores of teachers working in Primary, Middle, High and HigherSecondary school teachers.

<table>
<thead>
<tr>
<th>3</th>
<th>Type of Institution</th>
<th>High</th>
<th>Higher Secondary</th>
<th>Government School Teachers</th>
<th>Private Aided School Teachers</th>
<th>Private Unaided School Teachers</th>
<th>0.413</th>
<th>NS</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Locality of the school</td>
<td>Rural Teachers</td>
<td>282</td>
<td>79.84</td>
<td>12.91</td>
<td>5.12</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Urban Teachers</td>
<td>218</td>
<td>73.84</td>
<td>13.07</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Income</td>
<td>Below Rs.10000</td>
<td>407</td>
<td>76.89</td>
<td>13.78</td>
<td>2.03</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rs.10001- Rs.15000</td>
<td>78</td>
<td>78.54</td>
<td>12.27</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Above Rs.15001</td>
<td>15</td>
<td>74.50</td>
<td>8.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Medium</td>
<td>Tamil</td>
<td>292</td>
<td>76.53</td>
<td>14.29</td>
<td>1.40</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>English</td>
<td>208</td>
<td>78.21</td>
<td>11.73</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Service</td>
<td>Below 5 years</td>
<td>215</td>
<td>78.11</td>
<td>12.91</td>
<td>12.54</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5-10</td>
<td>210</td>
<td>78.79</td>
<td>12.88</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Above 10</td>
<td>75</td>
<td>70.33</td>
<td>13.61</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Working hours</td>
<td>8</td>
<td>405</td>
<td>75.56</td>
<td>13.69</td>
<td>22.96</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8-10</td>
<td>69</td>
<td>88.20</td>
<td>2.49</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>16</td>
<td>69.06</td>
<td>9.10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>10</td>
<td>82.30</td>
<td>3.30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Subjects taught</td>
<td>Arts</td>
<td>328</td>
<td>80.34</td>
<td>10.20</td>
<td>7.631</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Science</td>
<td>172</td>
<td>71.29</td>
<td>16.23</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Designation</td>
<td>SGT</td>
<td>111</td>
<td>77.58</td>
<td>13.53</td>
<td>1.22</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BT</td>
<td>277</td>
<td>77.79</td>
<td>12.88</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>P.G.</td>
<td>112</td>
<td>76.50</td>
<td>14.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
teachers. Primary school teachers have better family adjustment than the other groups.

- There is no significant difference between the mean family adjustment scores of Government, Private aided and Private unaided school teachers.
- There is a significant difference between the mean family adjustment scores of Rural and Urban teachers. Rural teachers have better family adjustment than the Urban school teachers.
- There is no significant difference between the mean family adjustment scores of teachers’ income Rs.5000, Rs.5001- Rs.10000, Rs.10001- Rs.15000 and above Rs.15001.
- There is no significant difference between the mean family adjustment scores of teachers’ teaching in Tamil and English medium.
- There is a significant difference between the family adjustment scores of teachers having below 5 years, 5- 10 years and above 10 years of service.
- There is a significant difference between the family adjustment scores of teachers whose work load is 8 hours, 8-10 hours, 10 hours and 12 hours.
- There is a significant difference between the mean family adjustment scores of arts and science subject taught.
- There is no significant difference between the mean family adjustment scores of teachers SGT, BT and P.G. designation.
- The correlation coefficient among empowerment and family adjustment of teachers is positive and significant.

IX. CONCLUSION

Empowerment and family adjustment of women school teachers is high. Locality of the study and Medium of instruction of the teachers cause some difference in the empowerment of women teachers. Educational Qualification, Nature of Institution, Locality of the school, Service, Working hours and Subjects taught cause some difference in the family adjustment of women teachers. Urban Tamil medium taught teachers are more empowered than their counter parts. All other personal conditions are not making any difference in the women teacher’s empowerment. So women teachers should choose empowered locality to reside. SGT or BT designated, U.G. Qualified Primary Teachers working in Rural Government School, teaching English medium with below 10 years’ experience show more family adjustment. Most of the personal variables cause certain difference in the family adjustment of the women school teachers. It is the individual responsibility of the women teachers to develop a family adjustment skill.

REFERENCES


AUTHORS

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An Investigation of Board of Directors’ Composition, Level of Independence and Financial Performance of Selected Saccos in Kericho County, Kenya

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Abstract- Over the recent past, the SACCOS sector has experienced persistent poor financial performance. This is inspite of the fact that the sector is an important contributor of the economies growth in Kenya. Previous studies indicate that corporate governance in SACCOS is a critical driver of performance in the sector. The purpose of this study is to establish the effect of composition of Board of directors and level of Independence on financial performance of SACCOS in Kericho County. Stratified simple random sampling techniques was used to identify respondents. A sample of 119 was drawn from a population of 169 respondents in the three selected SACCOS in Kericho County. Questionnaire was used to collect the primary data. The secondary data was collected from the financial reports of the SACCOS. Majority of the respondents strongly agreed that the boards of directors of their SACCOS were experts in decision making which maximize the shareholders wealth in the SACCOS. Majority of the respondents opined that the board of directors is free to air their views about shareholders investments in the SACCOS and the board has freedom to determine the financial status of the SACCOS. The study established that diversity of the board increase the resources brought in by individual board members and the organization access to external resources. It was further established that women and minority board members are the positively influence the performance of SACCOS. The study recommends that the organization to maximize employee’s multi-dimensional abilities for better performance. Underperforming SACCOS should also review their composition and level of independence of board of directors to enhance financial performance.

Index Terms- Board of director’s composition, Independence, Firm performance

I. INTRODUCTION

In recent years, following massive corporate failures, the subject of corporate governance has received much attention both from the stakeholders and the scholars. Good corporate governance shields a firm from future financial distress. Corporate Governance can be defined as a set of processes and structures forcontrolling and directing an organization. It constitutes a set of rules, which governs the relationships between management and stakeholders (Bhagat & Jefferie; 2002).

SACCOS are voluntary associations where by members regularly pool their savings and obtain loans for use in different purposes. The idea behind the establishment of Savings and Credit Co-operative Society (SACCOS) is to promote savings and make credits available to the members. SACCOS are the important microfinancing institutions for mobilization of financial resources for various development activities particularly in rural areas where majority of Kenyans live and earn their livelihood from agriculture. SACCOS have become powerful and dominant institutions. They have reached every corner of the globe in various sizes, capabilities and influences. Their governance has influenced economies and various aspects of social landscape. Shareholders are seen to be losing trust and market value has been tremendously affected. Corporate governance has become an important factor in managing organizations. The empirical literature shows that a lot of studies try to measure the corporate governance influence on financial performance and the literature has found conflicting relationship (Vafeas&Theodorou; 1998, Brick & Rashid et al., 2010) found no relationship between board independence and firm performance.

According to Awan (2012) there is a positive association between board independence and firm performance proxy by Tobin Q, return on asset and return on equity. Ameer et al. (2010) study also found a positive relationship between board independence and firm performance. Adams and Ferreira, (2009) found that women have better board meetings attendance than men. However, they found gender to have a negative relationship on firm performance. Erhardt et al (2003) finding was contradictory as they found a positive relationship between percentage of women on board and firm performance. Simpson et al. (2010) also suggested that board diversity through women representation has positive effect on firm performance through increased profitability and shareholders return. Nina, Valdemar and Mette (2006) found a positive relationship between number of women on top management and firm performance but performance strongly depend on their qualification due to the changing roles of government in cooperative development, necessitated by rapid globalization and liberalization. It has become absolutely necessary that countries keep track of these changes lest the pace of SACCOS development becomes hopelessly inconsistent with the rest of the sectors.

Board independence is the degree to which board members are dependent on the current CEO or organization - is considered key to the effectiveness of board monitoring (Fama & Jensen, 1983; Jensen & Meckling, 1976). Boards consisting primarily of insiders (current or former managers/employees of the firm) or
dependent outside directors (directors who have business relationships with the firm and/or family or social ties with the CEO) are considered to be less effective in monitoring because of their dependence on the organization. Independent boards – those primarily consisting of independent outside directors – are thought to be the most effective at monitoring because their incentives are not compromised by dependence on the CEO or the organization.

Some empirical support has found out that there is a link between independent boards and firm performance. An alternative perspective would suggest that inside directors have more and better information which allows them to evaluate managers more effectively (Baysinger & Hoskisson, 1990). This approach fits with resource dependence theory. Resource dependence theorists view a firm as an open system, dependent on external organizations and environmental contingencies (Pfeffer & Salancik, 1978). Proponents of this perspective see corporate boards as resource providers. Four types of resources are provided by boards: 1) advice and counsel, 2) legitimacy, 3) channels for communicating information between the firm and external organizations, and 4) preferential access to commitments or support from important elements outside the firm (Hillman et al., 2000; Pfeffer & Salancik, 1978).

Numerous governance guidelines advocate increased representation by women and minorities on corporate boards of directors to better reflect the gender and racial diversity of their customers, employees, and other stakeholders. The request for greater boardroom diversity is based primarily on normative grounds of equity and fairness (Carter et al., 2007). The monitoring role of the board of directors is an important control mechanism in a firm’s corporate governance. The quality of control by the board of directors is affected by the gender composition of the board since the contribution of women can gain competitive advantage (Huse & Sollberg, 2006). As a result, firm’s financial performance will also be affected by the division of men and women within a board. The effect of women as a board member has been discussed for many years and by many researchers (Burke & Mattis, 2000; Bilimoria, 1995; Morrison, 1992) has been done about the role of women in boards. Previous research show that the effect of gender diversity in a board can be of value in corporate governance. Female board members have different views compared to men and are therefore present in a firm’s board since the presence of female board members would be of added value in the decision-making process. For example, women can bring diversity, cross-cultural awareness and transformational leadership skills to the boards (Adler, 1997). The role of women in a board improves the quality of the board’s independence since they function seriously, prepare better for meetings than men and ask critical questions frequently (Huse & Sollberg, 2006). Huse and Sollberg (2006) find that the lack of preparations of men reduces the independency of the board members and managerial dominance. By preparations and asking critical questions, the female directors become less dependent of reports and presentations made by the management. By preparing well, the women have the possibility to influence the decision-making process and improve their status as directors. Huse (2005) finds that this sometimes starts a positive virtuous circle for improving board behaviour and board effectiveness. The presence of women in the board makes the male directors keener and better prepared.

Singh (2008) and Kramer et al. (2008) find that the addition of a female board member is an improvement compared to a board filled with only men. Kramer et al. (2008) find that male CEOs mention the presence of female members in a board as positive towards a board’s productivity and political correctness. A board with only male members may play ‘games’ or get carried away with the agenda leading to less effective performance and worse governance (Singh, 2008; Kramer et al., 2008). Hillman et al. (2002) find that the demand for breadth leadership and diversity on a corporate level increases due to the current market environment. For instance, female board members hold more advanced degrees and join many boards at a faster rate compared to male board members. Consequently, researchers (Robinson & Dechant, 1997; Zelechowsk & Bilimori, 2004) find that the market environment demands more gender diversity on top level functions. Hence, research suggests a relation between gender diversity and a firm’s financial performance measured by its group performance.

The outcome of good corporate governance mechanisms is an accountable to board of directors who ensures that the investors’ interests are not jeopardized (Hashanah & Mazlina, 2005). The accountability and transparency component of corporate governance would help SACCOs to gain shareholders’ and investors’ trust. These stakeholders need assurance that the SACCOs will be run both honestly and cleverly. This is where corporate governance is critical (Morck & Steier, 2005). A corporate governance mechanism improves stakeholders’ confidence and this would aid the sustainability of business in the long run. The present corporate governance theories cannot fully explain the intricacy and heterogeneity of corporate business. Governance may differ from country to country due to their various cultural values, political and social and historical circumstances. In this sense, governance in developed countries and developing countries can vary due to the cultural and economic contexts of individual countries.

The presence of an effective corporate governance system within the SACCOs sector in Kenya helps provide a degree of confidence that is necessary for the proper functioning of the entire SACCOs sector and enhance financial performance. Based on the various literature review the effect of composition and level of independence of board of directors on financial performance is not consistent and vary with the firms and dimensions of corporate governance adopted. From the empirical evidence it is clear that a lot of studies have been conducted with respect to the relationship between corporate governance mechanisms and firms” performance. In the Kenyan context however not very many studies have been done relating to the SACCO sector. Many researchers have put great attention to banking and other service industries thereby ignoring other sectors like SACCO sector which are still prone to corporate governance issues despite the fact that all sectors are important players in Kenya’s economy.

Board composition refers to the number and the type of board members, board demographics, board structure, board education and evaluation, and board leadership (Zahra & Pearce, 2001). Other scholars view board composition to be denoted by the fraction of non-executive directors on the board as compared...
to their executive counterparts (Udiale, 2010; Lawal, 2012). The non-executive directors are normally referred to as outsiders and the executive directors are referred to as insiders. Board composition is considered an important factor in the performance of three board roles (Hilman, Keim & Luce, 2001). The board of directors needs to have the appropriate structure and this involves several dimensions (Van der Bergh & Levrau, 2004).

The effect of board composition on overall financial performance is not at all clear. According to Davidson & Rowe, (2004), one problem with measuring the relationship between board composition and financial performance could be that their relationships are endogenously determined, (Hermalin & Weisbach, 2000). A second problem may be that due to fixed board terms and periodic reporting, the relation may be inter-temporal (Davidson & Rowe, 2004). They developed a theory of inter-temporal endogeneity of board composition and financial performance. Inter-temporal endogeneity is the idea that board composition in one period influences financial performance in later periods, and financial performance in one period influences board composition in later periods. Thus, board composition and financial performance influences each other but the effect is delayed, (Davidson & Rowe, 2004).

In Kenya, board composition is prescribed under Section 113 and 12 of the Capital Markets Authority Act, (CMA Act, 2000) that empowers the Capital Markets Authority to make rules and regulations to govern capital markets in Kenya. The CMA guideline on corporate governance practices (2002) has proposed that a balanced board constitutes an effective board. It therefore requires that the board of directors of every listed company should reflect a balance between the independent non-executive directors and executive directors. The independent and non-executive directors should form at least one-third of the membership of the board to ensure that no individual or small group of individuals can dominate board decision making processes.

The composition of the board may be used to solve the principal-agent problem. The Boards should be ready to increase meetings frequency if the situation requires a high supervision and control (Shivdasani & Zenner, 2004). They should balance the costs and benefits of frequency. For example, if the board increases the frequency of its meetings, the recovery from poor performance is faster (Vafeas, 1999). Jensen (1993) argues that separating CEO and chairman roles is in the shareholders' interest. Similarly, large firms that separate the two functions trade at higher price-to-book multiples (Yermack, 1996) and have higher return on assets and cost efficiency ratios than firms where the same person holds both titles. Studies of the impact of boards/board effectiveness on corporate profitability and shareholder value have dominated corporate governance research in finance.

These researchers focused on the influence of non-executive directors, splitting of the roles of chairman and chief executive, or the introduction of board sub-committees, have enhanced board effectiveness which in turn has added to shareholder value. For example Dahya et al. (2002) investigated the relationship between top management turnover (a measure of board effectiveness) and financial performance (a measure of management effectiveness). Others have studied the appointment of non-executive directors and their role in monitoring company management, on behalf of shareholders (Bhagat & Black, 2002). Research has considered whether there is a positive relationship between the number of non-executive directors and corporate financial performance, generally showing that there is (Ferguson, Lennox & Taylor, 2005).

Corporate Governance is constantly changing and evolving and changes are driven by both internal and external Environmental dynamics. The internal environment has a fixed mindset of shareholders' relationship with stakeholders and maximizing profits. Whilst, issues in the external environment such as the breakup of large conglomerates like Enron, mergers and acquisitions of corporation, business collaborations, easier financial funding, human resource diversity, new business startups, globalization and business Internationalization, and the advance of communication and information technology have directly and indirectly caused the changes in corporate governance. The current Corporate Governance theories cannot fully explain the complexity and heterogeneity of corporate business. Governance for different countries may vary due to its cultural values, political and social and historical circumstances. In this sense, governance for developed countries and developing countries can vary due to the culture and Economic contexts of individual country. Moreover, an effective and good Corporate Governance cannot be explained by one theory but it is best to combine a variation of theories, addressing not only the social relationships but also emphasize on the rules and legislation and strict enforcement surrounding good governance mechanisms.

Corporate governance has received much attention in the accounting literature with studies on the accounting literature and the assessment of corporate governance and the financial performance of SACCOs. Brown and Caylor (2004) provide insight to the relationship between good corporate governance and performance. Persistent poor financial performance of SACCOs has caused most SACCOs not to achieve their desired objectives of corporations and those of stakeholders. It is on this background that this research seeks to assess the effect of corporate governance mechanisms on financial performance of SACCOs in Kericho County.

The purpose of this study was to assess the effect of composition and level of independence of BOD on financial performance of Savings and Credit Cooperatives Societies in Kenya. Specifically, the study sought to establish the effect of composition of Board of Directors as spelt out in the by-laws of SACCOs on financial performance, to determine the effect of the level of independence of the board of directors on financial performance of SACCOs and to examine the effect of female and minority directors on financial performance of SACCOs.

II. RESEARCH METHODOLOGY

2.1. Research Design

The study will use a descriptive research design survey which includes surveys and fact findings on enquiries of different kinds. According to Gall and Borg (2006), descriptive research designs portray accurately the characteristics of a particular individual situation or group. The data was collected so as to assess the effect of composition and level of independence of the BOD on financial performance of SACCOs in Kericho County.
The design will use a primary research method in that it will collect data from the respondents with the use of questionnaires to be filled by the top management and staff of SACCOs sampled in Kericho County.

2.2. Study Area

The study was conducted in Kericho County where the selected SACCOs are diversified and varied in terms of number of employees and performance of each organization. The geographical area of Kericho covered in the study was as defined by County.

2.3. Target Population

A target population is that group from which the study is designed and generalizations of the findings are to be made from (Kothari, 2011). The target population will consist of 169 respondents from the three selected SACCOs operating in Kericho County as distributed in Table 1.

<table>
<thead>
<tr>
<th>Target Population</th>
<th>Name of the SACCO</th>
<th>Top Mgt</th>
</tr>
</thead>
<tbody>
<tr>
<td>SACCO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kenya highlands</td>
<td>24</td>
<td>29</td>
</tr>
<tr>
<td>Ndege Chai</td>
<td>22</td>
<td>47</td>
</tr>
<tr>
<td>Imarisha</td>
<td>26</td>
<td>21</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>72</strong></td>
<td><strong>97</strong></td>
</tr>
</tbody>
</table>

Source: (SACCOs Human Resource Departments)

2.4. Sample size and Sampling Techniques

Kothari (2011) asserts that a sample size should not be too large or too small to compromise the cost effectiveness and accuracy respectively in meeting the objectives of the study. Studies require optimum sample size from the accessible population in order to meet requirements for research (Mugenda and Mugenda, 2003). Bluman (2004) argues samples cannot be selected in a haphazard way because the information obtained might be biased. A survey was conducted on the three (3) selected SACCOs in Kericho County. The sample size, \( n \), for target residents with a known population, \( N \), is calculated using Israel (1992) formula as shown below

\[
n = \frac{N}{1 + N(e)^2}
\]

Where \( e \) is the desired precision (0.05 for 95% confidence level). The total number of respondents in the three selected SACCOs In Kericho County is 169, implying \( n \) is as derived below:

\[
n = \frac{169}{1 + 169(0.05)^2} = 119
\]

This study utilized mixed sampling techniques. The flow of sampling techniques involved area sampling, followed by purposive sampling in specific aspects and stratified sampling enriched with simple random method without replacement. Stratified random sampling is a modification of random sampling in which population is divided into two or more relevant and significant strata or groups based on one or more attributes (Saunders, Lewis & Thornhill, 2007). Stratified sampling was used to separate the respondents into top management and SACCO’s staff. The concerted effort brought into the design by these different techniques is expected to yield balanced and generalizable outcome.

In the first stage, the researcher identified the 3 selected SACCOs in Kericho County to form the geographic clusters. The respondents was proportionately categorized into two separate strata namely; top management and SACCOs staff, member then the sample was selected from each cluster using purposive sampling method. The sum of these strata will form the final sample will derived using random sampling method with proportional allocation. The researcher determined the proportion of study subjects in the final sample by adopting Bowley’s proportional allocation formula as follows:

\[
n_h = \frac{n N_h}{N}
\]

Where:

- \( n_h \) = number of units allocated to each stratum or sample division.
- \( n \) = total sample size
- \( N_h \) = number of items in each stratum (sample division) in the Population.
- \( N \) = population

The final sample distribution of SACCOs is shown in Table 2.

<table>
<thead>
<tr>
<th>Sample size</th>
<th>Name of the SACCO</th>
<th>Top Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kenya highlands</td>
<td>6</td>
<td>32</td>
</tr>
<tr>
<td>Ndege chai</td>
<td>6</td>
<td>42</td>
</tr>
<tr>
<td>Imarisha</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>20</strong></td>
<td><strong>99</strong></td>
</tr>
</tbody>
</table>

Source: (Survey Data, 2016)

The strata Sample sizes for the different study respondents calculated using Bowley’s formula is as indicated in table 2 above giving a total sample size to be 118 respondents.

2.5. Data Collection

The questionnaire was preferred as an instrument because the forms are completed and returned by respondents as compared to interviews where flexibility can result in inconsistencies across interviews. It is also less expensive compared to such instruments like observation which requires a lot of time with respondents and enables respondents to remain anonymous so as to enforce the concept of confidentiality. By remaining anonymous the respondent were able to point out any shortcomings in an organization Questionnaires also allows one to talk about personal/personnel problems. Information collected from a questionnaire can easily be analyzed. Indeed all the questions in the questionnaire was derived from the research objectives and research questions of the study.

The validity for data collection instrument shows the extent at which the content of the Questionnaire actually measures the concept. According to Nahid (2003), “validity is concerned with whether the findings are really about what they appear to be about”. It refers to how well a specific research method measures
what it claims to measure (Kothari, 2004). There are three tests for researchers to test validity: Construct, internal and external validities (As cited in Yin, 2003). Construct validity was used in the research to test validity of instruments and will involve tactics such as establishing chain of evidence and having key informants review the questionnaire. Validity of the instruments was estimated using internal consistency technique. Internal consistency is a measure based on the correlations between different items on the same test or the same subscale on a larger test (Kothari, 2004). In the research, this can be accomplished by grouping questions in a questionnaire into groups. Validity can also be tested by discussing the questions with the supervisors and colleagues to minimize ambiguity and errors.

Reliability of measurement concerns the degree to which a particular measuring procedure gives similar results over a number of repeated trials (Orodho, 2003). Reliability is the degree of consistency between two measures of the same thing (Mehems 1984). A pilot survey was undertaken to assess the effects of composition and level of independence of board of directors on financial performance of 3 SACCOs in Kericho county using the pre-test questionnaires at different occasions of the research for consistency in records and correlation of the results. There are various ways in which qualitative researchers try to show that their findings are reliable (Kothari, 2004; Nahid, 2003). The researcher will test reliability of the instrument by conducting pilot testing of the instrument with members of a SACCO in Bomet County.

The study utilized primary data collection technique by use of self-administered questionnaires to each respondent sampled to minimize non-response. Secondary data from relevant publications were used to supplement the primary data. Both open and close-ended questions were used by a list of possible alternatives, which the respondents will select their choices from. Open-ended gave the respondents opportunity to respond in their own way and words. Both qualitative and quantitative techniques were be used to analyze data thus helping the researcher to describe and compare variables numerically. Qualitative data was be analyzed using descriptive statistics such as the means, percentages.

III. FINDINGS

The researcher sought to find out the gender of the respondents. Gender of the respondents is significant because it indicates level of gender balance in answering the questions, the results are shown on Table 3

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>54</td>
<td>54</td>
</tr>
<tr>
<td>Female</td>
<td>46</td>
<td>46</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

According to the research findings 54(54%) of the respondents were male while 46(46%) were female. The findings showed that majority of the participant were male.

The researcher also sought to find out the education level of the selected respondents had attained. Level of education of the respondents indicates how well they will answer the set questions. The response of the respondents were sorted and summarized in figure 1

![Education level of the Respondents](image)

**Fig 1: Education level of the Respondents**

The finding shows the education level of the respondents. The findings shows that 25(25%) had secondary level, 50(50%) had college/technical education and the remaining 25(25%) had university level. Majoriity of the respondents had college level.

The finding shows the position held by the respondents. The response of the respondents were sorted and summarized in Table 4

<table>
<thead>
<tr>
<th>Position Held</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive Director</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Non-executive</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>Director</td>
<td>33</td>
<td>33</td>
</tr>
<tr>
<td>Manager</td>
<td>33</td>
<td>33</td>
</tr>
<tr>
<td>Head of Department/Section</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

The finding shows the position held by the employees in the SACCO. The findings shows that 8(8%) of the respondents worked as executive director 9(9%) were non-executive director, 33(33%) were manager and the remaining 50(50%) were Head of Department / Section. Majority of the employees were Head of Department / Section.

The finding below shows the year's respondents have worked in the organization. The response were sorted and summarized in Fig 2.
Figure 2 Years Worked in the Organization

Fig 2 shows that employee who have worked less than 1-5 years were 10(10%), while 50(50%) had worked for 10-15 years, 20(20%) had worked for 15-20 years and the remaining 7(29%) had worked for above 10 years. Majority of the respondents had worked for 10-15 years hence understand effect of composition and level of independence of board of directors on financial performance of selected SACCOS in Kericho County, Kenya. The finding shows the effect of Board of Directors on financial performance of SACCO. The response of the respondents were sorted and summarized in Table 5.

Table 5:
Effect of Board of Directors on financial performance of SACCO

<table>
<thead>
<tr>
<th>Effect</th>
<th>S A 1</th>
<th>A 2</th>
<th>UD 3</th>
<th>D 4</th>
<th>S D 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>The board of directors of my SACCO are concerned with shareholders’ interests</td>
<td>71(71%)</td>
<td>20(20%)</td>
<td>1(1%)</td>
<td>4(4%)</td>
<td>4(4%)</td>
</tr>
<tr>
<td>The board of directors of my SACCO are more concerned with their personal interests than shareholders’ interests</td>
<td>51(51%)</td>
<td>30(30%)</td>
<td>9(9%)</td>
<td>6(6%)</td>
<td>4(4%)</td>
</tr>
<tr>
<td>The shareholders of my SACCO are satisfied with the role of the board of directors in ensuring that financial performance brings profit to the shareholders.</td>
<td>40(40%)</td>
<td>30(30%)</td>
<td>9(9%)</td>
<td>6(6%)</td>
<td>5(5%)</td>
</tr>
<tr>
<td>The board of directors have enough knowledge to help the SACCO make profit on shareholders behalf</td>
<td>61(61%)</td>
<td>30(30%)</td>
<td>2(2%)</td>
<td>1(1%)</td>
<td>3(3%)</td>
</tr>
<tr>
<td>The board of directors monitor financial performance of the SACCO for the benefit of shareholders</td>
<td>49(49%)</td>
<td>32(32%)</td>
<td>6(6%)</td>
<td>3(3%)</td>
<td>7(7%)</td>
</tr>
<tr>
<td>The board of directors of my SACCO are experts in decision making which maximize the shareholders wealth in the SACCO</td>
<td>66(66%)</td>
<td>25(25%)</td>
<td>2(2%)</td>
<td>4(4%)</td>
<td>4(4%)</td>
</tr>
<tr>
<td>The board of directors accept that the accounting system in my SACCO contribute to SACCO’s Profits</td>
<td>41(41%)</td>
<td>30(30%)</td>
<td>19(19%)</td>
<td>5(5%)</td>
<td>5(5%)</td>
</tr>
<tr>
<td>The board of directors of my SACCO are knowledgeable enough to govern the activities of the shareholders</td>
<td>65(65%)</td>
<td>26(26%)</td>
<td>2(2%)</td>
<td>3(3%)</td>
<td>4(4%)</td>
</tr>
<tr>
<td>The board of directors of my SACCO protect and maximize the financial performance of the SACCO</td>
<td>51(51%)</td>
<td>40(40%)</td>
<td>1(1%)</td>
<td>1(1%)</td>
<td>4(4%)</td>
</tr>
<tr>
<td>The board of directors of my SACCO makes sure the SACCO management accounts for the shareholders investments in the SACCO.</td>
<td>47(47%)</td>
<td>34(34%)</td>
<td>6(6%)</td>
<td>3(3%)</td>
<td>10(10%)</td>
</tr>
<tr>
<td>The board of directors of my SACCO ensures that the necessary internal financial control systems are put in place and monitored regularly</td>
<td>76(76%)</td>
<td>15(15%)</td>
<td>2(2%)</td>
<td>3(3%)</td>
<td>5(5%)</td>
</tr>
<tr>
<td>The board of directors behavior of my SACCO is aligned with the objectives of the shareholders</td>
<td>51(51%)</td>
<td>40(40%)</td>
<td>4(4%)</td>
<td>1(1%)</td>
<td>1(1%)</td>
</tr>
</tbody>
</table>

The study showed that 71(71%) strongly agreed, 20(20%) agreed on the view that the board of directors of my SACCO are concerned with shareholders’ interests while 1(1%) were undecided 4(4%) disagreed and the rest 4(4%) strongly disagreed. Nevertheless the study findings indicated that 51(51%) strongly agreed thought that the board of directors of my SACCO are more concerned with their personal interests than shareholders’ interests, 30(30%) agreed as compared to 9(9%) who were undecided the rest 6(6%) disagreed and the rest 4(4%) strongly disagreed. The study findings indicated that 40(40%) strongly agreed that the shareholders of my SACCO are satisfied with the role of the board of directors in ensuring that financial performance brings profit to the shareholders, 30(30%) agreed as compared to 9(9%) who were undecided the rest 6(6%) disagreed and the rest 5(5%) strongly disagreed. On the other hand 61(61%) strongly agreed on the view that the board of
Directors have enough knowledge to help the SACCO make profit on shareholders behalf, 30(30%) agreed, 2(2%) were undecided, 1(1%) who disagreed while the rest 3(3%) strongly agreed. The study findings indicated that 49(49%) strongly agreed, 32(32%) agreed, 6(6%) were undecided 3(3%) disagreed and the rest 7(7%) strongly disagreed. On the other hand 66(66%) of the total respondent strongly disagreed while 25(25%) agreed as on the view that the board of directors of my SACCO are experts in decision making which maximize the shareholders wealth in the SACCO 2(2%) were undecided while 4(4%) and 4(4%) disagreed and strongly disagreed respectively. The study showed that 41(41%) strongly agreed, 30(30%) agreed, 6(6%) were undecided 3(3%) disagreed and the rest 4(4%) strongly disagreed. Nevertheless the study findings indicated that 65(65%) strongly agreed that the board of directors of my SACCO are knowledgeable enough to govern the activities of the shareholders, 26(26%) agreed as compared to 2(2%) who were undecided while 19(19%) were undecided 5(5%) disagreed and the rest 5(5%) strongly disagreed. The study findings indicated that 51(51%) strongly agreed that the board of directors of my SACCO protect and maximize the financial performance of the SACCO, 40(40%) agreed as compared to 1(1%) who were undecided the rest 1(1%) disagreed and the rest 4(4%) strongly disagreed.

On the other hand 47(47%) strongly agreed on the view that the board of directors of my SACCO make sure the SACCO management accounts for the shareholders investments in the SACCO, 34(34%) agreed, 6(6%) were undecided, 3(3%) who disagreed while the rest 10(10%) strongly agreed. The study findings indicated that 76(76%) strongly agreed that The board of directors of my SACCO ensures that the necessary internal financial control systems are put in place and monitored regularly, 15(15%) agreed, 2(2%) were undecided 3(3%) disagreed and the rest 5(5%) strongly disagreed. Lastly but no least the study findings indicated 51(51%) and 40(40%) strongly agreed and agreed on the view that the board of directors behaviour of my SACCO is aligned with the objectives of the shareholders, 4(4%) were undecided, 1(1%) disagreed while the rest 1(1%) disagreed. Majority of the respondents strongly agreed that the boards of directors of my SACCO are experts in decision making which maximize the shareholders wealth in the SACCO.

The finding shows the effect of independence of the board of directors on financial performance of SACCO. The response of the respondents were sorted and summarized in Table 6

| Table 6: Effect of Independence of the Board of Directors on financial performance of SACCO |
|---------------------------------|--------|--------|--------|--------|--------|
| Effect of Independence of the Board of Directors | S A 1 | A 2 | UD 3 | D 4 | SD 5 |
| The board of directors are free to air their views about shareholders investments in the SACCO | 49 (49%) | 28 (28%) | 5 (5%) | 13 (13%) | 5 (5%) |
| The board of directors are free to form and implement standards of conduct of SACCO employees | 40 (40%) | 27 (27%) | 13 (13%) | 10 (10%) | 10 (10%) |
| The board of directors are free to contribute to the management of uncertainties in the outside the SACCO | 38 (38%) | 36 (36%) | 28 (28%) | 10 (10%) | 8 (8%) |
| The manager of the SACCO is free to make financial decisions in favour of stakeholders | 40 (40%) | 21 (21%) | 18 (18%) | 10 (10%) | 15 (15%) |
| Board and accounting system | 49 (49%) | 28 (28%) | 8 (8%) | 10 (10%) | 10 (10%) |
| The board is free to monitor the financial performance of the SACCO | 46 (46%) | 23 (23%) | 10 (10%) | 13 (13%) | 13 (13%) |
| The board freely contribute to the strategic direction of the SACCO | 44 (44%) | 36 (36%) | 5 (5%) | 13 (13%) | 10 (10%) |
| The board have freedom to determine the financial status of the SACCO | 49 (49%) | 28 (28%) | 5 (5%) | 13 (13%) | 5 (5%) |

The analyzed questions showed the following findings on the board of directors are free to air their views about shareholders investments in the SACCO in that 49(49%) of the total respondent strongly agreed while 28(28%) did agreed as compared to 5(5%) who were undecided, 13(13%) disagreed and 5(5%) strongly disagreed. Moreover 40(40%) of the total respondent strongly agreed of the view that the board of directors are free to form and implement standards of conduct of SACCO employees 27(27%) agreed while 13(13%) were undecided as compared to those 10(10%) who did not agreed and 10(10%) strong disagreed of the total respondents. Moreover the study findings indicated that 38(38%) strongly agreed 36(36%) and did agreed with this statements because they were of the opinion there the board of directors are free to contribute to the management of uncertainties in the outside the SACCO, 28(28%) were undecided while 10(10%) and 8(8%) disagreed and strongly disagreed. The manager of the SACCO is free to make financial decisions in favour of stakeholders was another factor as indicated by the study findings which shows that 40(40%) strongly agreed, 21(21%) agreed 18(18%) were undecided while 10(10%) and 15(15%) disagreed and strongly disagreed. Board and accounting system was also viewed as another factor with 49(49%) and 28(28%) strongly agreed and agreed as compared to 8(8%) those who were undecided, disagreed and strongly disagreed were both 10(10%).

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Moreover the study findings indicated that 46(46%) strongly agreed 23(23%) and did agreed with this statements because they were of the opinion that the board is free to monitor the financial performance of the SACCO, 10(10%) were undecided while 13(13%) and 13(13%) disagreed and strongly disagreed. The board freely contribute to the strategic direction of the SACCO another factor as indicated by the study findings which shows that 44(44%) strongly agreed, 36(36%) agreed 5(5%) were undecided while 13(13%) and 10(10%) disagreed and strongly disagreed. Board and accounting system was also viewed as another factor with 49(49%) and 28(28%) strongly agreed and agreed as compared to 8(8%) those who were undecided, disagreed and strongly disagreed were both 10(10%). Finally the study findings indicated 49(49%) and 28(28%) strongly agreed and agreed on the view that the board have freedom to determine the financial status of the SACCO, 5(5%) were undecided, 13(13%) disagreed while the rest 10(10%) disagreed. Majority of the respondents opined that the board of directors is free to air their views about shareholders investments in the SACCO and the board has freedom to determine the financial status of the SACCO.

Regarding the role of women participation, the finding shows the effect of women and minority members of the Board of Directors on financial performance of SACCO. The response of the respondents were sorted and summarized in Table 7

### Table 7

<table>
<thead>
<tr>
<th>Effect of women and minority members of the Board of Directors on financial performance of SACCO</th>
<th>S A</th>
<th>A 2</th>
<th>UD</th>
<th>D 4</th>
<th>S D</th>
</tr>
</thead>
<tbody>
<tr>
<td>The board of directors of the SACCO is having enough women and minority members</td>
<td>28(28%)</td>
<td>36(36%)</td>
<td>15(15%)</td>
<td>13(13%)</td>
<td>8(8%)</td>
</tr>
<tr>
<td>Because the board has enough women and minority members it is contributing to good financial performance of the SACCO</td>
<td>40(40%)</td>
<td>21(21%)</td>
<td>18(18%)</td>
<td>10(10%)</td>
<td>10(10%)</td>
</tr>
<tr>
<td>There is a relationship between gender composition of the board and financial performance of the SACCO</td>
<td>44(44%)</td>
<td>31(31%)</td>
<td>13(13%)</td>
<td>8(8%)</td>
<td>5(5%)</td>
</tr>
<tr>
<td>The quality of control of financial performance of the SACCO’s financial performance are better when women and Minority persons are represented in the board</td>
<td>49(49%)</td>
<td>28(28%)</td>
<td>8(8%)</td>
<td>10(10%)</td>
<td>5(5%)</td>
</tr>
<tr>
<td>Gender and diversity in the board contribute to the valuable decision making process on issues of financial performance of the SACCO</td>
<td>46(46%)</td>
<td>23(23%)</td>
<td>10(10%)</td>
<td>8(8%)</td>
<td>13(13%)</td>
</tr>
<tr>
<td>Gender and diversity in the board contribute to improvements of the independence of the board of the SACCO when making financial decisions</td>
<td>36(36%)</td>
<td>38(38%)</td>
<td>5(5%)</td>
<td>13(13%)</td>
<td>10(10%)</td>
</tr>
<tr>
<td>Gender and diversity in the board contribute to the boards productivity</td>
<td>36(36%)</td>
<td>28(28%)</td>
<td>15(15%)</td>
<td>21(21%)</td>
<td>0(0%)</td>
</tr>
<tr>
<td>Gender and diversity in the board has contributed to the current state of financial performance of the SACCO</td>
<td>40(40%)</td>
<td>21(21%)</td>
<td>18(18%)</td>
<td>20(20%)</td>
<td>0(0%)</td>
</tr>
<tr>
<td>Diversity of the board increase the resources brought in by individual board members and the organization access to external resources</td>
<td>56(56%)</td>
<td>44(44%)</td>
<td>0(0%)</td>
<td>0(0%)</td>
<td>0(0%)</td>
</tr>
<tr>
<td>Diversity of the board contribute to new insights and perspectives thus increasing creativity and innovation</td>
<td>49(49%)</td>
<td>28(28%)</td>
<td>8(8%)</td>
<td>10(10%)</td>
<td>5(5%)</td>
</tr>
</tbody>
</table>

The study found out that 28(28%) and 36(36%) of the respondent strongly agreed and agreed that the board of directors of the SACCO is having enough women and minority members while 15(15%) were undecided 13(13%) and 8(8%) disagreed and strongly disagreed. On the hand, because the board has enough women and minority members it is contributing to good financial performance of the SACCO and 40(40%) strongly agreed, 21(21%) agreed, 18(18%) were undecided while 10(10%) and 10(10%) disagreed and strongly disagreed. Most of the respondents 44(44%) strongly agreed that there is a relationship between gender composition of the board and financial performance of the SACCO, 31(31%) agreed 13(13%) of the total respondent were undecided as compared to 8(8%) and 5(5%) who disagreed and strongly disagreed respectively. Moreover 49(77%) of the total respondent strongly agreed that the quality of control of financial performance of the SACCO’s financial performance are better when women and Minority persons are represented in the board 28(28%) agreed 8(8%) were undecided while 10(10%) disagreed and 5(5%) strongly disagreed.

The study showed that 46(46%) strongly agreed, 23(23%) agreed on the view that gender and diversity in the board contribute to the valuable decision making process on issues of financial performance of the SACCO while 10(10%) were undecided the rest 8(8%) disagreed and 13(13%) strongly disagreed. Nevertheless the study findings indicated that 36(40%) strongly disagreed thought that Gender and diversity in the board contribute to the board’s productivity, 28(21%) agreed as compared to 15(18%) who were undecided the rest 21(21%) disagreed. The study findings indicated that 40 (40%) strongly
agreed that gender and diversity in the board has contributed to the current state of financial performance of the SACCO the rest 31(31%) agreed 18(18%) were undecided the rest 20(20%) disagreed.

On the other hand 56(56%) strongly agreed and the remaining 44(44%) strongly agreed on the view that diversity of the board increase the resources brought in by individual board members and the organization access to external resources. Finally the study findings indicated that 49(49%) and 28(28%) strongly agreed and agreed respectively that diversity of the board contribute to new insights and perspectives thus increasing creativity and innovation 8(8%) were undecided 10(10%) disagreed and the rest 5(5%) strongly disagreed. Majority of the respondents were in agreement that diversity of the board increase the resources brought in by individual board members and the organization access to external resources.

The finding shows the factors contribute to the financial performance of the SACCO. The response of the respondents were sorted and summarized in Table 8

**Table 8**

<table>
<thead>
<tr>
<th>Factors contribute to the financial performance of the SACCO</th>
<th>1. Being the most contributor</th>
<th>2. Moderate contributor</th>
<th>3. Least contributor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board directors of</td>
<td>49(49%)</td>
<td>36(36%)</td>
<td>15(15%)</td>
</tr>
<tr>
<td>Independence of the board of directors</td>
<td>40(40%)</td>
<td>42(42%)</td>
<td>18(18%)</td>
</tr>
<tr>
<td>Women minority board members</td>
<td>59(59%)</td>
<td>36(36%)</td>
<td>5(5%)</td>
</tr>
</tbody>
</table>

The study found out that 49(49%) agreed that Board of directors are the most contributor, 36(36%) suggested that they are moderate contributor and the remaining 15(15%) opined that they are least contributor. The study show that 40(40%) agreed that independence of the board of directors, 42(42%) suggested that they are moderate contributor and the remaining 18(18%) opined that they are least contributor. Finally 49(49%) agreed that women and minority board members, 36(36%) suggested that they are moderate contributor and the remaining 15(15%) opined that they are least contributor. Majority of the respondents agreed that women and minority board members are the most contributors in the SACCO.

IV. CONCLUSIONS

The findings showed that majority of the participant were male. The researcher sought to find out the gender of the employees. Gender of the respondents is significant because it indicates level of maturity in answering the questions, finding show that majority of the respondents had college level. Majority of the employees were Head of Department / Section.

Majority of the respondents had worked for 10-15 years hence understand effect of composition and level of independence of board of directors on financial performance of selected SACCOs in Kericho County, Kenya

Majority of the respondents strongly agreed that the boards of directors of their SACCOs were experts in decision making which maximize the shareholders wealth in the SACCO. Majority of the respondents opined that the board of directors is free to air their views about shareholders investments in the SACCO and the board has freedom to determine the financial status of the SACCO

Majority of the respondents were in agreement that diversity of the board increase the resources brought in by individual board members and the organization access to external resources. Majority of the respondents agreed that women and minority board members are the most contributors in the SACCO. Having analyzed the data and the findings the researcher came up with the following Conclusions as possible remedial measures to be taken in the organization. The study concluded that Motivational factors of employee improves organization performance .It’s also concluded that it promotes career development and reduces monotony and motivates in the organization.

From the findings the researcher recommends that the organization should put in place strategic management in order to enhance application of employee methods. It also recommends that the organization to maximize employee’s multi-dimensional abilities for better performance. From the findings the researcher recommends that the targeting SACCOs that are under performing and analyzing their composition and level of independence of board of directors on financial performance mechanisms can lead to improvements that unlock a SACCOs hidden value.

The study suggested that further study be done oneffect of composition and level of independence of board of directors on financial performance of selected SACCOs in Kericho County, Kenya.

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Efficacy of Accounting Systems on the Performance of Public Universities in Kenya: A Case of Egerton University

Joyce Cherotich Malait*, Dr. Isaac K. Naibei**, and Dr. Joseph K. Kirui***

Abstract- Accounting systems is a system that records and process data of transaction and events into meaningful information for use in planning, controlling and operation of business. The purpose of this study was to establish the effect of accounting systems on performance of Public Universities in Kenya. The study adopted descriptive research design using a case of one public University in Kenya. The study targeted all the 106 staff working in the Administration and Finance division of Egerton University. Simple random sampling technique was used to select 83 respondents out of which 79 respondents participated in the study. Data was collected using self-administered questionnaire. Quantitative data collected were analyzed using descriptive statistics. Simple regression model was also used to analyse the results. The study established that there was statistically significant relationship between Accounting systems and the performance of university. The study recommends that the management of university should consider and improve on their Accounting systems to enhance accuracy of accounting reports, customer satisfaction, management accountability and transparency, since they significantly affected their performance. The study also recommended that the same study be carried out in Finance and Microfinance institutions, private and other public sectors to find out if the same results would be obtained.

Index Terms- accounting systems, public universities, Kenya

I. INTRODUCTION

Accounting is an essential part of any business, large or small owners, profit making or not for profit making organizations. Accounting plays a very important role in the management and success or failure of contemporary business institutions. Manual and computerised accounting systems perform basically the same processes, the accounting principles and concepts are the same with differences lying in the technicalities of the process. Although accounting system is expensive, its advantages lie on speed and being able to store information. Accounting systems are responsible for recording, analyzing, monitoring and evaluating the financial condition of companies, processing of documents necessary for tax purposes and providing information support to many other organizational functions, Amidu et al., (2011).

The revolution in information technology has significantly changed the nature of business and created competitive advantages for those who appreciate its effects Porter et al., (1985). The advent of IT has affected the form and substance of information, accounting not excepted. With proper systems, new and updated financial information could be readily available for purposes of, among others, making decisions. Moreover, the accounting systems need also be able to capture the non-financial information to support the financial information for better decision-making Brecht et al., (1996). Thus, the accounting systems should be able to produce relevant, accurate, reliable, and timely information to users in the information age. It shows that successful implementation of accounting systems will benefit improvement in work qualities, improved flexibility, motivation of using software application, increased productivity and performance. Accounting Systems allows a company to manage its business with potential benefits of improved process flow, reduced inventories, better data analysis, better customer service and improved profit margins Fang et al.,(2006).

According to Romney et al., (2000), an accounting system is a system that processes data and transactions to provide users with information they need to plan, control and operate their business. In this definition, accounting information systems are considered as tools that help management in planning and controlling processes by providing the relevant and reliable information for decision making. From this perspective, accounting system functions are not solely for purpose of producing financial reports rather the role goes beyond this traditional view and can also be used as a controlling mechanism such budgeting. Full adoptions of the system will essentially require attainment of all the benefits of the system. Gelinas et al.,(2005), asserts that Accounting System is a system which combines accounting principles and concepts as well as the concept of information system to record, process, analyse and produce financial information to its users for making economic decisions. Performance measurement is the process whereby an organization establishes the parameters within which programs, investments, and acquisitions are reaching the desired results Graham et al., (1998). Controlling performance is also critical in measuring the organizational performance. Controlling ensures that the organization know how well they are progressing along the route, how correct their map is, and what deviations, if any they need to make to stay on course.

Managers are usually judged on their performance in one of the three principal Ways, in terms of business outcomes turnover, profits, return on investment, in cases where they are directors or senior managers; in terms of their agreed departmental/unit
objectives, as agreed under some system of management by objectives an approach especially favoured for middle management levels, in terms of how they have performed generally in carrying out their responsibilities, as stated or implied in their job descriptions, and where performance is assessed as much on the individual manager’s input into the job as on any outcomes he or she has achieved, Cole, (2005). The chief goal of a business is to achieve financial or maximization of wealth for the Shareholders Becker et al., (1996). These include measures that impact on effectiveness, efficiency, development, satisfaction, innovation, product quality, profitability and sales growth. According to Schuler (1992), drawing on behavioural psychology perspective, organizational performance can be observed in terms of its sales growth, profit growth, improved quality, global response to competition, and global business performance and success.

In all forms of business units, accounting information are of crucial importance. In fact, they are the basis to any business success. Moreover, economic conditions and competition create pressure about costs of information. Generally, maintenance of sound Accounting records is a major factor that contributes proper decision making process since it is the root through which relevant informational requirements is derived and aid individuals in performing their jobs. Consequently, public and private sector firms in both developing and developed economies view Accounting System as a vehicle to ensure effective and efficient information flow in the recording, processing, and analysis of financial data. Effective and efficient information flow enhances managerial decision-making, thereby increasing the firm’s ability to achieve corporate and business strategy objectives Manson et al., (2001).

The Public Universities in Kenya has for the last decade seen various expansions with establishments of new universities, expansion of academic programmes, expansion of learning centres and increased competition. The public universities have continued to incorporate information technology in their operations to remain competitive and visible in their web presence. Currently, public universities management are put on performance contracting by the Government and the attainment of these performance contracts are cascaded downwards to various university units. Several studies have been conducted on accounting systems, Nzomo (2013) In the Study “Impact of Accounting Information System on Organisational Effectiveness of Automobile Companies in Kenya”, Management in the automobile organizations in Kenya relies heavily on information generated from the AIS employed by the company. Quality reports are very key to arrive at an ideal investment. Traditional way of recording, summarizing and reporting company financial reports led to less optimal decisions. Investment in good and reliable accounting systems has become a major concern for all managers as it leads to better management and analysis of firm’s performance.

The findings of the study indicated that Accounting Information Systems are an important mechanism for organizations’ effective management, decision-making and controlling activities. The study concluded that AIS are critical to the production of quality accounting information on a timely basis and the communication of that information to the decision makers. For instance, Study done by Otieno et al., (2013), found that only 36% of the institutions reported that they had a regular program or equivalent in place while another 24% were in the process of implementation of the computerised system. More than 40% of the participating institutions lacked computerized audit implementation plan.

Ismail et al.,(2007), also found out that the information systems of accounting work smoothly as they connect information from the top and bottom that help workers in companies to achieve their goals, in addition using these systems will enable companies to give accurate information to the relevant government agencies. Moreover, no research has been carried out on the Effects of accounting systems on performance of public universities in Kenya.

Therefore this study will be useful in addressing the gaps left in the previous studies elsewhere and extent it more specifically to Public Universities in Kenya at large. The overall objective of the study was to establish the effect of accounting systems on performance of Public Universities in Kenya. Study conducted by Otieno et al., (2013),On the Effect of Computerised Accounting Systems on Audit Risk Management in Public Enterprises, Established that only 36% of the institutions reported that they had a regular Program or equivalent in place while another 24% were in the process of Implementation of the computerised system. More than 40% of the participating Institutions lacked computerized audit implementation plan.

Ismail et al.,(2007) Studied the factor influencing the alignment of accounting information system in small and medium sized Malaysian manufacturing firms. The study aimed to identify the factors that affect the use of accounting information systems in factories, small and medium-sized Malaysian manufacturing firms. The study also found out that the information systems of accounting work smoothly as they connect information from the top and bottom that help workers in companies to achieve their goals, in addition using these systems will enable companies to give accurate information to the relevant government agencies.

Nzomo (2013), In the Study entitled “Impact of Accounting Information System on Organisational Effectiveness of Automobile Companies in Kenya, It was found that, the Management in the automobile organizations in Kenya relies heavily on information generated from the AIS employed by the company. Quality reports are very key to arrive at an ideal investment. Traditional way of recording, summarizing and reporting company financial reports led to less optimal decisions. Investment in good and reliable accounting systems has become a major concern for all managers as it leads to better management and analysis of firm’s performance. This has led the researcher to investigate on the application and use of accounting systems by automakers and thus, its impact on the organizational effectiveness.

The findings of the study indicated that Accounting Information Systems are an important mechanism for organizations’ effective management, decision-making and controlling activities. The results are consistent with empirical reviews which indicated that there exist a relationship between AIS and organizational performance. AIS are an effective decision-making tool for controlling and coordinating the activities of an organization. The study concluded that AIS are critical to the production of quality accounting information on a
timely basis and the communication of that information to the decision makers. 

Hunton (2002) study investigated the relationship between automated accounting information system and organizational effectiveness; showed that there was strong relationship between accounting information system and organizational effectiveness, which means access to accounting information, will lead to organizational effectiveness. Several recent studies on value of accounting information for equity valuation, share price and earnings prediction have queried current financial reporting model in the developed world. The same issue can be raised in Kenya about the value relevance of accounting numbers to investors. This assists the researcher to determine whether the result agrees or digresses from the previous studies.

Christopher et.al (2014) , studied the Adoption of Computerized Accounting Systems by Coffee Societies in Kenya. This study sought to analyze the effect of the hindrances affecting the adoption of computerized accounting system by coffee societies in Nyeri County. The findings of the study indicate that: Coffee societies have not fully adopted computerized accounting systems; Cost, human resource proficiency and availability of related infrastructures are the most important hindrances affecting adoption of computerized accounting system; and users’ perception on the computerized accounting systems is insignificant in respect to adoption of computerized accounting systems but further studies may be commissioned to confirm or disapprove our findings.

According to Samuel (1991), financial reports are outputs of an accounting system and they are prepared at the end of the year, hence the name final accounts. According to Horne (1998), the financial reports should include a narrative description of the organizations activities and audited financial statements. He argues that these enable the stakeholders to see the organization’s performance and the overall financial situation of the organization. Samuel (1991), states that managers and accountants are usually required to defend the results shown in the financial reports as part of the accountability process. According to Indira (2008), timeliness is an important characteristic of quality financial information. To benefit users, financial information must be presented at the right time otherwise it loses relevance. Relevance is also a characteristic of quality of financial reports. Frankwood indicates that financial information is relevant if it is capable of making a difference in decisions made by helping users to form predictions about the outcomes of the past, present and future events either to confirm or correct prior expectations. Comparability is another characteristic, Frankwood (1999) also stresses that users must be able to compare the financial statements of the enterprise over time in order to identify trends in its financial position and performance. According to Pallai (2007) Understand ability as a quality of financial reporting that enables users to perceive the significance of financial information. He argues that users are assumed to have reasonable knowledge of business and willingness to study and understand the information.

II. RESEARCH METHODOLOGY

The study was carried out in the main campus Egerton University in Nakuru county Kenya, and it was limited to the topic effects of accounting systems on performance of Public Universities in Kenya.

The research study used Descriptive research design. Kothari, (2004), descriptive studies are those studies which are concerned with describing the characteristics of particular individual or of a group. Descriptive research designs are used in preliminary and explanatory studies to allow researcher to gather information, summarize, present and interpret for the purpose of clarification. The strategy is popular both in business and management research since it answers the questions of who, what, where and how much in the study Saunders, Lewis, & Thornhill, (2009). The justification for using this design is that it explored the existing Status of two or more variables at a given time. Therefore descriptive research design is thus suitable in studying the effects of accounting systems on performance of Public universities in Kenya.

Target population is defined as a set of individuals, cases/objects with some common observable characteristics of a particular nature distinct from other population. The target population of the study is 106 employees of Egerton university main campus, within Accounting and Finance, Audit, I.C.T and Procurement departments.

<table>
<thead>
<tr>
<th>Departments</th>
<th>Population (Frequency)</th>
<th>Percentage%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finance and Accounts</td>
<td>55</td>
<td>51.8</td>
</tr>
<tr>
<td>Finance</td>
<td>3</td>
<td>2.8</td>
</tr>
<tr>
<td>Internal Audit</td>
<td>4</td>
<td>3.7</td>
</tr>
<tr>
<td>I.C.T</td>
<td>27</td>
<td>25.4</td>
</tr>
<tr>
<td>Procurement</td>
<td>17</td>
<td>16.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>106</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Source: Research data, (2017)

Sampling is the process of selecting a sub-set of cases in order to draw conclusions about the entire sets. According to Cohen,(2003), determinants such as expense, time and accessibility frequently prevent researchers from gaining information from the entire population ,therefore there is need to obtain a smaller group of subset of the total population in such a way that is representative of the total population under study.
The sample size for this study was determined using Krejcie’s (1970) formula:

\[ n = \frac{\chi^2 Npq}{(d^2 (N-1) + \chi^2 pq)} \]

Where:
- \( n \) = desired sample size
- \( N \) = target population
- \( p \) = population proportion (take 0.5)
- \( \chi^2 \) = the table chi-square value for one degree of freedom relative to the desired level of confidence

This yielded a sample size of 83 was proportionately distributed across the various departments as shown below in Table 2.

### Table 2
**Distribution of Sampled Respondents according to Departments**

<table>
<thead>
<tr>
<th>Departments</th>
<th>Population (Frequency)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finance and Accounts</td>
<td>43</td>
<td>51.8</td>
</tr>
<tr>
<td>Finance</td>
<td>2</td>
<td>2.8</td>
</tr>
<tr>
<td>Internal Audit</td>
<td>4</td>
<td>3.7</td>
</tr>
<tr>
<td>I.C.T</td>
<td>21</td>
<td>25.4</td>
</tr>
<tr>
<td>Procurement</td>
<td>13</td>
<td>16.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>83</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

*Source: Research data, (2017)*

In picking the 83 respondents that constitute the sample size, simple random sampling technique were used. This is appropriate since population of interest is subdivided into homogenous groups or strata to obtain a representative sample.

Research instruments are techniques of data collection such as a quantitative standardised instrument Creswell, (2003), Van Manen(1990). The study collects primary data for the purpose of analysing the relationship between accounting systems and performance of public universities in Kenya. Primary data was collected using a questionnaire. The past studies were referred in literature review ,theories and variables of the study. The researcher used questionnaire as the main tool for collecting data from all the categories of respondents. The selection of these tools has been guided by the nature of data to be collected, the time available as well as by the objectives and hypotheses of the study. The researcher is mainly concerned with the views, opinions, perceptions, feelings and attitudes. Such kind of information can be best collected through the use of questionnaires (Cohen et al, 2000). The questionnaire to be designed in this study comprised of two sections. The first part is designed to determine the fundamental issues including the demographic characteristics of the respondents, while the second part consist questions where the variables were focused.

Validity of the instrument according to Mugenda, (1999) refers to how accurately the tool measures what it is designed to measure. Essentially, validity is concerned with establishing whether the questionnaire content is measuring what it is supposed to measure. Validity is the degree to which the empirical measure or several measures of the concepts, accurately measure the concept. Content validity is a non-statistical method used to validate the content employed in the questionnaire; the variables selected for this study were obtained from previous studies and tested for relevance.

Reliability is the degree to which an assessment tool produces stable and consistent results Phelan et al,(2006). Test were used to establish the reliability of the research instruments. The responses were compared using Cronbachs alpha reliability coefficient which normally ranges between 0 and 1. From the study, a correlation coefficient of more than 0.6 indicated a high reliability of the research instruments.

Data collection involves a self administered questionnaire. The researcher drops the questionnaires and then leaves the questionnaires with the respondents and picks them later. Each questionnaire is coded and only the researcher knows which person responded. The coding technique is only used for the purpose of matching returned completed questionnaires with those delivered to the respondents.

The data collected was then coded, edited and analyzed using Descriptive statistics. Descriptive techniques usually employ factual information about a situation to provide an understanding of performance levels. Wilson, (2006), Descriptive statistics is statistical devices that help summarize data. The measures of the independent variables, using the rating /Likert scales were converted to mean values and then to percentage to permit application of Simple regression model.

A Simple regression model was used for the analyses of data. The effect of accounting systems on performance of public universities in Kenya was determined by the equation below:

\[ Y_1 = \alpha + \beta_1 X_1 + \epsilon \]

Where:
- \( Y_1 \) = Accounting Systems
- \( \alpha \) = Constant (Performance of the University not attributable to Accounting Systems)
- \( X_1 \) = Accounting Systems
- \( \epsilon \) = Is Error term

Specific Equations
1. \( Y_1 = \alpha + \beta_1 X_1 + \epsilon \)  Where \( Y_1 \) = Accuracy of Accounting Reports
- \( \alpha \) = Constant
- \( X_1 \) = Is Accounting Systems
- \( \epsilon \) = Is Error term

2. \( Y_2 = \alpha + \beta_2 X_1 + \epsilon \) Where \( Y_2 \) = Customer Satisfaction.
3. $Y_3 = \alpha + \beta_3X_1 + \varepsilon$ Where $Y_3$=Management Accountability and Transparency.

Organization Performance= $\alpha + \beta X$ (Accounting Systems) +$\varepsilon$

III. FINDINGD AND DISCUSSIONS

The study targeted 83 respondents in collecting data with regard to the effect of accounting systems on performance of public universities in Kenya. From the study 79 out of the 83 sampled respondents filled-in and returned the questionnaires making a response rate of 95.1%. This is a reliable response rate for data analysis as Barbbie (2012) posted that any response of 50% and above is adequate for analysis.

The study sought to focus on gender distribution within Egerton University in which the respondents worked. This observation of the distribution of respondents according to gender and the role played in the use of accounting systems. To analyse this, the respondents were asked to state the gender within the University. Findings revealed that majority (53.2%) of the respondents were male, while 46.8% of the respondents were female. This shows that majority of the staff who works in the University are male and female are few in number.

Concerning the age brackets of the respondents within the study revealed that the majority of the respondents were below the age of 35 years. The details of the age brackets of the respondents is presented in Table 3.

<table>
<thead>
<tr>
<th>Age bracket of the Respondents</th>
<th>Frequency</th>
<th>Percentage (%)</th>
<th>Cumulative (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25-35 years</td>
<td>38</td>
<td>48.1</td>
<td>48.1</td>
</tr>
<tr>
<td>36-45 years</td>
<td>31</td>
<td>39.2</td>
<td>87.3</td>
</tr>
<tr>
<td>46-50 years</td>
<td>4</td>
<td>5.1</td>
<td>92.4</td>
</tr>
<tr>
<td>50 years and above</td>
<td>6</td>
<td>7.6</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>79</strong></td>
<td><strong>100</strong></td>
<td></td>
</tr>
</tbody>
</table>

Source: Research data (2017)

According to Table 4, majority of the respondents (77.2%) had 1st Degree,(16.5%) of the respondents had Masters Degree ,5.1% of the respondents had a Diploma and (1.2%) of the respondents had a Doctorate Degree. This indicates therefore that most of the respondents were educated hence well informed of the effects of Accounting Systems on performance of the University.

Regarding the number of years the respondents had served in the University as indicated in Table 4.5 below .46% of the respondents had served the university for 6-10 years ,(38%) of the respondents had served the University for 11-20 years,(13%) of the respondents had served the university for below five years and (3% ) of the respondents had served the university for 21 years and above.

From the Table 3, it was evident that majority(48.1%) of the employees indicated that they were between 25-35 years who are still active and energetic in the service ,(39.2%) of the respondents fell between (36-45) years who are still active and energetic also in service,(7.6%) of the employees indicated that they were above 50 years thus become inactive and no longer energetic and (5.1%) of the employees indicated that they were between 46-50 years and are lesser active and lesser energetic in service.

The research study sought to find out the highest education level the respondent had achieved. According to the findings shown in Table 4.4, 77.2% of the respondents had 1st Degree, 16.5% of the respondents had a Masters Degree, 5.1% of the respondents had a Diploma and 1.2% of the respondents had a Doctorate Degree.

<table>
<thead>
<tr>
<th>Table 4 Respondents Education level</th>
<th>Frequency</th>
<th>Percentage (%)</th>
<th>Cumulative percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diploma</td>
<td>4</td>
<td>5.1</td>
<td>5.1</td>
</tr>
<tr>
<td>1st Degree</td>
<td>61</td>
<td>77.2</td>
<td>82.3</td>
</tr>
<tr>
<td>Masters Degree</td>
<td>13</td>
<td>16.5</td>
<td>98.8</td>
</tr>
<tr>
<td>Doctorate</td>
<td>1</td>
<td>1.2</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>79</strong></td>
<td><strong>100</strong></td>
<td></td>
</tr>
</tbody>
</table>

Source: Research data (2017)

From the results in Table 5 ,The various number of years worked in the institution have some influence to help the university achieve the evaluation of effects of Accounting Systems on Performance whereby (46%) of the respondents had served in the University for 6-10 years thus a good representation of the number of staff who have worked there,(38%) of the respondents had served the University for 11-20 years,(38%) of the respondents had served the university for below five years and (3% ) of the respondents had served the university for 21 years and above.

The research study sought to find out the terms of service of the respondents. The study established that majority (72%) of the respondents indicated that there terms of service is permanent,(17% ) of the respondents indicated that there terms of service...
service is casual/contract and (11%) of the respondents indicated that there terms of service is Temporary.

After the describing the characteristics of the sample, the study descriptive analysis of the accounting systems and organizational performance was considered. Respondents were requested to state to what extent they agreed with specific statements regarding the accuracy of accounting records. The statement was ranked in terms of their mean and standard deviation to portray the outcome of the result.

Table 6
Descriptive statistics on accuracy of accounting reports

<table>
<thead>
<tr>
<th>Statement</th>
<th>Min</th>
<th>Max</th>
<th>Sum</th>
<th>Mean</th>
<th>Std. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting reports meets the needs of organization and timelines</td>
<td>0</td>
<td>5</td>
<td>262</td>
<td>3.32</td>
<td>1.419</td>
</tr>
<tr>
<td>Communication and coordination of activities is among departments</td>
<td>2</td>
<td>5</td>
<td>293</td>
<td>3.71</td>
<td>.663</td>
</tr>
<tr>
<td>Each department has measures of their quality of service</td>
<td>2</td>
<td>5</td>
<td>264</td>
<td>3.34</td>
<td>.749</td>
</tr>
<tr>
<td>Organization performance is measured regularly</td>
<td>0</td>
<td>5</td>
<td>259</td>
<td>3.28</td>
<td>1.414</td>
</tr>
<tr>
<td>Performance measures are shared regularly with staff</td>
<td>0</td>
<td>5</td>
<td>362</td>
<td>4.58</td>
<td>.496</td>
</tr>
<tr>
<td>Financial report users understand the reports and interpret</td>
<td>2</td>
<td>5</td>
<td>308</td>
<td>3.90</td>
<td>1.033</td>
</tr>
<tr>
<td>Financial reports are published regularly and shared among staff</td>
<td>1</td>
<td>5</td>
<td>296</td>
<td>3.75</td>
<td>.854</td>
</tr>
<tr>
<td>Reports generated meet the financial obligation and integration of cost data related to operation</td>
<td>2</td>
<td>4</td>
<td>240</td>
<td>3.04</td>
<td>.775</td>
</tr>
<tr>
<td>Reports used for data adjustment, amendment and decision making</td>
<td>2</td>
<td>5</td>
<td>284</td>
<td>3.59</td>
<td>.793</td>
</tr>
<tr>
<td>Managers set personal and business objectives in report preparation</td>
<td>2</td>
<td>5</td>
<td>279</td>
<td>3.53</td>
<td>.889</td>
</tr>
</tbody>
</table>

Source: Research data (2017)

The research sought to find out the agreement level of the respondents on the statements regarding the effect of accuracy of accounting reports on performance of the organization. According to the findings majority of the respondents strongly agreed that performance measures were shared regularly with staff in the University as shown by a mean of 4.53 with standard deviation of 0.713, the respondents also agreed that Financial report users understand the reports and interpret in the University as revealed with a mean value of 3.90 which is tending towards a maximum value of point 4 in the likert scale.

As presented in Table 6, the respondents agreed that the University Financial reports are published regularly and shared among staff as reflected by a mean of 3.75 with standard deviation of 0.854. However, this is done to improve the performance of the organization. The study as revealed in Table 4.8 also shows that the respondents seemed to agree that in the University communication and coordination of activities is among departments as reflected with a mean 3.71. However, the corresponding standard deviation also reflected a significant figure of 0.663. This shows that there is clear variation in the responses provided by the respondents about the accuracy of reports on improving performance of the organization.

The result reflected in Table 6, indicates that the respondents agreed that the reports were used for data adjustment, amendment and decision making as shown by mean of 3.59 and standard deviation of 0.793. This ensures that proper decisions are taken on improving performance of the organization. The respondents undecided also shows in that all the departments has measures of quality of service, organization performance are measured regularly and accuracy of accounting reports meet the needs of organisation whereas indicated by means of 3.34, 3.28 and 3.32 respectively with their corresponding standard deviations of 0.749, 1.414 and 1.419 respectively.

Table 7 shows the measures of effects of customer/client satisfaction on performance of University in different statement obtained from the respondents. The statement was ranked in terms of their mean and standard deviation to portray the outcome of the result.

Table 7
Descriptive statistics on Customer Satisfaction.

<table>
<thead>
<tr>
<th>Statement</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounting system improves speed of financial entries and transactions.</td>
<td>79</td>
<td>1</td>
<td>4</td>
<td>2.92</td>
<td>1.010</td>
</tr>
<tr>
<td>Accounting system helps improve timeliness of report generation.</td>
<td>79</td>
<td>2</td>
<td>5</td>
<td>3.71</td>
<td>.803</td>
</tr>
<tr>
<td>The use of accounting improves accounts record keeping and retrieval.</td>
<td>79</td>
<td>2</td>
<td>5</td>
<td>3.42</td>
<td>.914</td>
</tr>
</tbody>
</table>
Posting accounting transaction to the ledger and double entry helps quality of data compilation and operations. Accounting systems aid customer service, decision making process and accountability. Increase in the quality of statement analysis and management by customers. Accounting systems are aligned to the organizational objectives. Product ,service, quality has improved. Improvement in productivity, efficiency and gaining competitive advantage.

Source: Research data (2017)

From the results in the Table 7 it is clearly indicating that respondents were strongly agreeing that university customers are satisfied that there is increase in the quality of statement analysis and management by customers as per the rates shown by mean value of 4.32 which is tending towards maximum value of 4 in the Likert scale. However, the standard deviation of 0.885 suggests variation in responses by the various respondents. According to Table 4.9 ,it was found that respondents agreed that the customers are satisfied that the Accounting systems are aligned to the organizational objectives as shown by mean value of 4.33 .The revealed standard deviation of 0.674 seems to suggest variation in the responses generated for the test.

From the study in Table 7, it was found that respondents agreed that the accounting systems helps to improve timeliness of report generation to customer and helps in improving performance as reflected by mean value of 3.71. However, a standard deviation of 0.803 suggests a variation in responses generated by various respondents. From the same Table, respondents agreed that product; service quality has improved as indicated by mean value of 3.63 and standard deviation of 0.511 generated by the respondents.

Table 8 shows the measures of effects of management accountability and transparency on performance of University in different statement obtained from the respondents .The statement was ranked in terms of their mean and standard deviation to portray the outcome of the result.

<table>
<thead>
<tr>
<th>Management accountability and transparency</th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management adhere to policies and procedures in day to day operations</td>
<td>79</td>
<td>2.00</td>
<td>4.00</td>
<td>3.506</td>
<td>.552</td>
</tr>
<tr>
<td>Do the university management have open door policy</td>
<td>79</td>
<td>2.00</td>
<td>4.00</td>
<td>3.430</td>
<td>.592</td>
</tr>
<tr>
<td>University management share progress report</td>
<td>79</td>
<td>1.00</td>
<td>5.00</td>
<td>2.848</td>
<td>1.350</td>
</tr>
<tr>
<td>University management is clear with resources and operations within the university.</td>
<td>79</td>
<td>2.00</td>
<td>4.00</td>
<td>3.164</td>
<td>.940</td>
</tr>
<tr>
<td>Control of information within the university is exercised and universal access to information</td>
<td>79</td>
<td>2.00</td>
<td>4.00</td>
<td>3.279</td>
<td>.750</td>
</tr>
<tr>
<td>Organizational structure helps control ,integrate and co-ordinate work activities</td>
<td>79</td>
<td>1.00</td>
<td>5.00</td>
<td>3.670</td>
<td>.873</td>
</tr>
<tr>
<td>Information provided is important to both internal and external users.</td>
<td>79</td>
<td>1.00</td>
<td>5.00</td>
<td>3.747</td>
<td>1.315</td>
</tr>
<tr>
<td>Transaction process and steps taken by management towards achieving efficiency is satisfactory</td>
<td>79</td>
<td>1.00</td>
<td>5.00</td>
<td>4.051</td>
<td>.846</td>
</tr>
<tr>
<td>The level of training offered to staff is sufficient to spearhead the use of accounting systems.</td>
<td>79</td>
<td>1.00</td>
<td>5.00</td>
<td>2.823</td>
<td>1.196</td>
</tr>
<tr>
<td>Staff contribution to use and improve accounting systems in organization is influenced by motivation.</td>
<td>79</td>
<td>2.00</td>
<td>4.00</td>
<td>3.367</td>
<td>.559</td>
</tr>
<tr>
<td>Audit trail and audit database are undertaken regularly</td>
<td>79</td>
<td>.00</td>
<td>5.00</td>
<td>2.443</td>
<td>1.185</td>
</tr>
</tbody>
</table>

Source: Research data (2017)

Results of Table 8, shows a mean value of 4.05 which is tending to a maximum value of 5. This suggests that respondents agree with the statement that transaction process and steps taken by management towards achieving efficiency on accounting systems is satisfactory on improving performance .However a standard deviation of 0.845 reveals a variation in the responses generated by the respondents. It can deduced that the respondents agree that information provided is important to both internal and external users as provided by management .This is revealed by a mean value of 3.746 with a standard deviation of 1.315 which shows the variation in the responses by the respondents.
According to the same table 4.10, respondents seem to agree that the university management organization structure helps to control, integrate and coordinate work activities and improve performance. This is shown by mean value of 3.67 with a standard deviation of 0.872 suggests variation in responses given by the respondents.

Besides the descriptive statistics, a simple linear regression models was applied to determine the relative importance of each of the three dependent variables (accuracy of accounting reports, customer satisfaction, management accountability and transparency) with respect to the effects of accounting systems on the performance of public Universities in Kenya.

**Table 8: Accounting systems and accuracy of accounting**

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Std. Error of Estimate</th>
<th>R² Change</th>
<th>F Change</th>
<th>df1</th>
<th>df2</th>
<th>Sig. Change</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.246</td>
<td>.061</td>
<td>.049</td>
<td>.58601</td>
<td>.061</td>
<td>4.979</td>
<td>1</td>
<td>77</td>
<td>.029</td>
<td></td>
</tr>
</tbody>
</table>

Model Unstandardized Coefficients

<table>
<thead>
<tr>
<th>B</th>
<th>Std. Error</th>
<th>Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.438</td>
<td>.344</td>
<td></td>
</tr>
<tr>
<td>.213</td>
<td>.095</td>
<td>.246</td>
</tr>
<tr>
<td>2.231</td>
<td>.029</td>
<td></td>
</tr>
</tbody>
</table>

(a)Predictors: Constant (Accuracy of reports); (b) Dependent Variable: Accounting Systems

Source: Research data (2017)

The study thus established significant relationship between accuracy of reports and performance of universities in Kenya (p=0.00<0.05)

**Table 9: Accounting Systems and customer satisfaction**

<table>
<thead>
<tr>
<th>Model 1</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>2.511</td>
<td>.332</td>
<td>7.564</td>
<td>.000</td>
</tr>
<tr>
<td>Customer satisfaction Y2</td>
<td>.186</td>
<td>.089</td>
<td>.232</td>
<td>2.088</td>
</tr>
</tbody>
</table>

(a)Predictors: Constant (Customer satisfaction)

(b) Dependent Variable: Accounting Systems

Source: Research data (2017)

The established regression equation was Y=2.511+.186X₂+ε. The regression equation above has established that holding the factor (Customer satisfaction) constant, performance of the Universities in Kenya will be 2.511. The findings presented also shows that taking the independent variable at zero, a unit increase in accuracy of reports will lead to a .186 increase in the performance of universities in Kenya. The study thus established significant relationship between customer satisfaction and performance of universities in Kenya (p=0.00<0.05)
The established regression equation was: 
\[ Y = 0.575 + 0.797X_1 \]

The study used the R square. The R square is called the coefficient of determination and tells us how the Accounting system vary with performance of University. The independent variable Accounting systems explain 67.5% of the variance in performance of public Universities in Kenya as measured by management accountability and transparency. This means that other factors contribute 32.5% of management accountability and transparency on the Performance of Public Universities in Kenya. The study thus established significant relationship between accuracy of reports and performance of universities in Kenya (p=0.00<0.05)

The study found that the accuracy of reports affected performance of the university to a little extent. Performance measures were shared regularly with staff in the University affected the performance as the staff were aware of their expectation as shown by mean of 4.53. Financial report users understand the reports and interpret which also affected the performance of university to a very great extent as shown by mean of 3.90. The respondents strongly agreed that the financial reports are published regularly and shared among staff as shown by mean of 3.75.

From the study the respondents indicated that customer satisfaction affected performance of the university to a great extent. Customer satisfaction ensures that the organization is sustainable and gain competitive edge. The university was involved in aid of customer service, decision-making process and accountability as shown by mean of 3.39. The respondents strongly agreed that the increase in the quality of statement analysis and management by customers affected the performance of the university as it is necessary for the customers to understand the content of the statement as shown by mean of 4.32.

Finally the study found that Management accountability and transparency affected the performance of the university to a very great extent. The respondents strongly agreed that University transaction process and steps taken by management towards achieving efficiency is satisfactory as shown by mean value of 4.05. In this case, the transaction process could be considered effective from organization performance perspective. The study concluded that accuracy of reports affected performance of university. The performance measures are shared regularly among the departments in the university which is used for comparisons. From the findings the University Financial reports are published regularly and shared among staff affected performance this is done to improve performance in the University, it was also concluded that communication and
coordination of activities was among the departments also affected the performance as it helps sharing of information and attaining the same goals.

The regression analysis model also concludes that customer satisfaction affected performance of the University which the university needs to address since customers are important in any organization. Also it was concluded that increase in the quality of statement analysis and management by customers affected the performance since the customers can give feedback based on statement analysis and improve on performance. Finally, the study concludes that transaction process and steps taken by management towards achieving efficiency on accounting systems is satisfactory as this helps in improving performance, it was concluded that the university management adheres to policies and procedures in day to day operations which promotes transparency and accountability thus performance.

Based on the findings of the study, the study therefore recommended that accuracy of reports be considered since it affects performance of universities, financial reports to be published regularly and shared among the staff and also communication and coordination of activities should be among departments in order to achieve the goals. The study recommended that the university quality of statements, analysis and management by customers be looked into since it affects performance since customers give feedback and suggestion on decisions to be made, also it was recommended that improve on timeliness of report generation be done which affected the performance.

Finally, the study recommended that transaction process and steps taken by management towards achieving efficiency on accounting systems be done and all necessary support to that be allocated since it enhances performance of the whole university, also it was recommended that university management to control, integrate and coordinate work activities in the university this is very important since all the activities of the university are interlinked and thus improve in the performance. This study has reviewed the effect of accounting systems on performance of public universities in Kenya. To this end therefore, a further study should be carried out to establish how universities have been able to come up with various strategies, policies, and systems to comply with competitive business environment.

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Assessment of the Quality of Education in Newly Established Public Universities in Kenya: A Case of University of Kabianga

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Abstract - Higher education is very critical in promoting economic, social and political development of individual and society. Consequently, there has been unprecedented growth of universities in Kenya. The growth of universities in the country has resulted in a number of challenges that has raised issues on the quality of education being offered in the universities. Quality of education is a multidimensional concept that covers such aspects as levels of students’ achievement; relevance of the knowledge and skills acquired by learners; conditions of learning; content and methods of teaching and management of the education process. The main objective of this study was to assess quality of education in newly established public universities in Kenya, a case of University of Kabianga. The study used the following indicators to gauge the quality of university education in University of Kabianga, Availability and adequacy of physical facilities teaching and learning facilities, adequacy and quality of library resources, quality of examination management and processes, Quality of research activities, quality of teaching as well as the level of student support services. The study employed descriptive survey design. The target population comprised of 115 respondents. Stratified random sampling was used to select the respondents from the population and questionnaires were used in data collection. Data was analyzed using descriptive statistics with aid of SPSS thereafter presented using tables. The study found out that staff and students perceive that the University has inadequate resources to offer quality education; that despite the teaching at the University being of high quality because of experienced and qualified teaching staff, quality hampered by inadequate resources that supports quality teaching and learning of its students and that there are challenges that affect quality teaching and learning in University of Kabianga majorly brought about by inadequate funding by the Kenyan government hence affecting key resources and services that guarantee quality education. The findings and recommendations of the study will be useful for management in Kenya’s newly established public universities to be able to identify the causes of declining quality of education in Kenya and how well they can be prepared to meet the changes and challenges without quality of education being compromised. The study concluded that there is need to increase resources in the newly established universities so that quality education is maintained at all times.

Index Terms - Quality of education, Public Universities, Kenya

I. INTRODUCTION

The provision of quality education is one of the most important responsibilities of all governments in the world because education contributes to improving people’s lives and reducing poverty in many ways. This includes its role in helping people to become more productive and earn more, improvement in health and nutrition, enrichment and promotion of social development through strengthening social cohesion and giving people more opportunities (Psacharopoulos, 2002).

Education is one of the basic services offered by governments and other stakeholders to society. Authors like Bray et al (1986:40); Miller (2001:30) and Books (1996:3) posit that education is a tool for economic development. If education is to meet this goal, it must be of high quality. A survey by Synovate (2011) revealed that most Kenyans would prefer to study abroad, where they believe universities guarantee quality learning and are prestigious. The concept of quality of education is multi-faceted, and is articulated differently by different scholars. It is also important to note that the debate on the attributes of quality of education is still in progress. Thus, with no conclusive position as to what makes quality of education, it is critical that as many views as possible are analyzed have a comprehensive grasp of the key tenets of the quality of education. It is when a wider view of the quality of education is achieved that a fair attempt can be made in analyzing the internal efficiency of an education system, which is a key dimension of the quality of education. The quality debate has evolved over the years, with various definitions of quality coined at each stage, and several models used to analyze quality. Several indicators of quality have also been forwarded and a similar array of barriers to quality has also emerged, which have challenged initiatives to institute quality of education in several countries.

Quality is a fairly elusive concept to define. There are perhaps as many definitions of quality of education as there are people who care to define it; products or services that are consumed; and customers who consume the products or services. Thus, the concept of quality in a service (like education) is determined by the passive observer or critic; the service being delivered; and the way the customer views the service and the way it is delivered. Varied as they may be, the definitions of the quality of education generally converge on the analysis of information that might be employed to guide decisions about the provision of education. Hoy, et al (2000:10) say: Quality in
education is an evaluation of the process of educating which enhances the need to achieve and develop the talents of the customers of the process, and at the same time meets the accountability standards set by the clients who pay for the process or the outputs from the process of educating. According to this definition the key aspects of quality of education are developing the talents of customers in a value-laden way, meeting accountability standards and giving value for money paid. Grisay and Mahlick (1991:3) partly concur with this position when they say evaluating the quality of an educational system entails analyzing first and foremost: The extent to which the products or the results of the education provided (the knowledge, skills and values acquired by the students) meet the standards stipulated in the system’s educational objectives, The extent to which the knowledge, skills and values acquired are relevant to human and environmental conditions and needs. The two definitions focus on standards, but this by no means makes them comprehensive, as there is no guarantee that those standards are worth achieving in the first place. Standards seek to relate to needs of customers, which shift rapidly, thus making the definition of quality of education an elusive and rapidly shifting concept. Goddard and Leask (1992:20) highlight the place of customers in the definition of quality when they say, “Quality then is simply meeting the requirements of the customer.” For education, there are different customers, who include parents, government, students, employers, and institutions of higher learning, who all look for different characteristics of quality. The different customers do not only have different expectations of the education provided, but these expectations also change with time, making the quality of education a moving target.

Quality in Education is the degree to which education can be said to be of high standard, satisfies basic learning needs, and enriches the lives of learners and their overall experience of living (UNESCO, 2000). Universities have been challenged to maintain quality in curriculum development and delivery. Studies have shown that quantitative expansion of education may impact negatively on quality and equity if not handled carefully. Quality is a complex concept, and quality in higher education is especially ambiguous and sometimes even confusing. However, it is generally accepted that quality in higher education is perceived as consisting of a synthesis of conformity, adaptability and continuous improvement, (Cheserek, 2009). Quality is a synthesis of a range of expectations for many stakeholders. Students may focus on facilities provided and perceived usefulness of their education for future employment, while academic staff may pay attention to the teaching-learning process. On the other hand management may give importance to achieving an institution’s goals and objectives, whereas parents may consider the education achievement of their children. Employers may consider the competence of the graduates, and government may be interested in achieving education goals for its youth (Commission for Higher Education, 2008). This indeed shows that developing and maintaining standards in education; and promoting quality education remain a major challenge across education systems throughout the world. In Kenya, the process of quality assurance in curriculum development involves evaluation of an academic program to ensure it meets standards set by Commission of Higher Education (CHE). To achieve quality in curriculum, it is important to assess supporting academic resources (physical, academic, equipment, learning materials, texts and journals) (Cheserek, 2009).

Universities are ranked worldwide, with quality being a major consideration. No Kenyan university made it into the top 1,000 list during the 2010 Academic Ranking of World Universities, produced by Shanghai Jiao Tong University in China. The government admits the challenge that ‘The quality of learning in some universities has been declining’; There is a shortage of doctoral level lecturers as a result of rapid expansion and brain drain, (National strategy for University Education). The introduction of double intake in admission which was initiated in the Academic Year 2012/2013 has further stretched the capacities of the Universities. A careful analysis of objectives of university level training as set out in Republic of Kenya, (2009) underscores the importance of the universities and justifies current concern that they provide the kind of education and training expected of them. The stakeholders need an assurance that there is quality in provision of university education in Kenya.

With the increasing numbers of students seeking places in public universities, the question of quality is critical and requires urgent attention. Several Educationists in their studies found out that problems facing Public Universities such as overflowing classes, strained facilities, high fees and shortages of lecturers, turned students away since it affected quality of education offered. If the issue of deteriorating quality of education is not treated with the seriousness it deserves, Universities could be falling in realization of Kenya’s Vision 2030. All local and global stakeholders in education such as financial donors may reduce funding and trust in the graduates from University of Kabianga. The study therefore assessed the quality of education in the recently established public university of Kabianga in Kenya. It determined the perceptions of Students and staff on adequacy of resources, interaction between educational inputs and outputs and challenges in offering quality teaching in University of Kabianga. The general objective of this study was to assess the quality of education in newly established University of Kabianga.

An empirical survey conducted in Japan and Thailand with university students identified a total of 10 factors of service quality which were grouped into three categories of services such as academic, nonacademic, and facilities (Gamage, et al, 2008). In terms of the academic category, students considered quality of academic staff, quality of programs, and university reputation as important factors that influenced their perceptions of service quality. In the case of non-academic, factors such as financial assistance and tuition fees, counseling and support services, job placement services, and grievance procedures contributed to students’ perceptions of service quality. Finally with respect to facilities, students considered physical plants and facilities, library and computing facilities, and student organizations as important factors in their perceptions of service quality. The results of the above study suggest that perceived quality has a positive impact on student overall satisfaction. Thus, students who had high positive perceptions of services being offered at their universities tended to report a higher level of overall satisfaction. This implies that, to maintain students’ overall satisfaction, university administrators should enhance students’ perceived quality. The results also suggested that academic factor
most strongly impacts on students’ overall satisfaction followed by the non-academic factors and finally the facilities factors.

Learning facilities are critical to provision of quality education in Universities in Kenya. Several research results shows that majority of public Universities in the country do not have adequate facilities to support provision of quality education. Lack of adequate lecture halls, desks, chairs and tables affected learning as overcrowding affect learners acquisition of competency skills required at University level. Inadequate learning facilities hinder the achievement of quality education. For Universities to achieve quality education, availability of quality educational facilities and good infrastructure is necessary. These quality facilities have been found to be a major determinant of the school learning environments (Boakye-Boaten, 2015). They have also been found to be positively related to good academic achievement by learners (Wangari, 2003). Physical facilities, teaching and learning resources are basic to the process of implementation of a curriculum (Stevenson, 2007). The success or failure of the implementation of a programme may well depend on the availability or non-availability of instructional materials and facilities (Higgins et al., 2005). Standa (1980) cited in Chepkorir et al., (2014) put it in a seminar paper that more attention is required to the provision of adequate facilities and resources and opportunities for teachers to share ideas on the use of available, accessible and appropriate resources in the solution of educational problems.

Facility dimension is associated with accessibility of physical facilities which protect academic activities as well as non-academic activities. Based on various researches, this dimension is mentioned as tangibles, physical features, and physical issues. Besides, there are studies which modify these dimensions to several particular dimensions known as entertaining facilities, and computing facilities (Athiyaman 1997, Ford, Joseph et al. 1999, Sohail and Shaikh 2004). Based on the research of Sohail and Shaikh (2004), the physical facilities of the higher education institutions contain the lighting of the lecture halls, campus building appearance, design of lecture halls, and cleanliness of the campus as well the easement of the classrooms and study rooms. Aldridge and Rowley (1998) represent that, Physical facilities such as library services, technology facilities, and lecture rooms have a significant effect on students’ educational experience. Based on the result of two studies which were conducted by LeBlanc and Nguyen (1997) and Sohail and Shaikh, (2004), overall students’ perceived service quality can be affected by students’ abilities through accessing to facilities offered by their higher education institutes. Accessibility to facilities includes comforting access to the computer facilities, parking facilities, and classroom facilities.

The teaching facility (lecture room, laboratory, tutorial room and/or discussion room) should maintain standards, as stipulated in the IUCEA guidelines (2006), in order to assure quality teaching. This refers to the size of classrooms/lecture halls and laboratories vis-a-vis the number of registered students for that course and its duration. The expectation here would be that a teaching facility used for a period of three hours should be comfortable for teacher and student alike in order to facilitate learning (Cheserek, 2009). The lecture halls need to be fitted with equipment that fosters learning as well as makes the lecturer and students comfortable. Security for students and lecturers need to be observed at all times.

Studies have however revealed that there is a shortage of physical facilities in public universities in Kenya. The World Bank (2000) and Cheboi (2001) noted that financial resources directed to university education were inadequate. Cheboi (2006) observed that shortage of facilities affected the quality of higher education. He further observed that poor recreation facilities affected quality of higher education. Report of The Public Universities Inspection Board (Republic of Kenya, 2006) noted that quality and quantity of teaching and learning materials particularly information technologies impact in a very significant way on the quality of teaching and research. The Board further noted that accelerated growth in student numbers in the public universities had not been matched by expansion of physical facilities and academic infrastructure and that some of the existing infrastructure was inadequate, dilapidated and in bad state of despair.

According to Okwakol (2008), most African universities do not have adequate physical facilities such as lecture rooms, office, and library and laboratory spaces to provide a suitable learning and teaching environment. She noted that 55% of laboratory equipment in most departments in universities was not in a state in which they could be used to carry out experiments. The net effect of this scenario was that only about half the experiments were done. Okwakol (2008) as cited by Gudo (2011) noted that a computer is increasingly becoming the major notebook, textbook, dictionary and storage facility for information for students in quality institutions of higher learning. She noted that universities that fail to utilize the benefits of the digital age-computer assisted learning, web connectivity and networked learning cannot offer quality education. Library facilities and information systems in almost all universities are antiquated. Books and scholarly journals are not only few but very old and are therefore irrelevant to current institutional needs and priorities.

Manyasi (2010) while studying how using information technology could increase access to higher education through distance learning in Kenya found that institutions of higher learning lacked the necessary technology. The institutions had only a few computers, which were used by lecturers to access internet services. Lecturers lacked instructional competencies and information design for distance learning associated with delivery of high quality services. Advances in Information Technology could provide solution for the demand in university education in Kenya. However, there was insufficient institutional preparedness. Apart from inadequate space and shortage of current books and journals, public universities did not have satisfactory internet provision for the learners. This was a great impediment to provision of quality teaching and learning.

Studies by Waituru (1999), Maria et al (2003) and Mutsya (2010) have also singled out shortage of lecturers as serious threat to offering quality university education. Shortage of lecturers reduces efficiency of lecturers in offering effective services for quality education in public universities in Kenya (Gudo et al; 2011). Public universities have more part time than permanent lecturers. Part time staff are available for the scheduled lecturing hours but not for consultations with students (Gudo, et al; 2011). This has led to a situation where students are
denied an opportunity for deeper understanding of a subject matter through critical inquiry in guided debate and practice. Shortage of lecturers is a cause of concern since coping mechanism would involve increased workload and employment of incompetent staff. For effective teaching to take place at a university there is a minimum ratio of lecturing staff against the number of enrolled students to be achieved. The Commission of University Education (CUE) has worked out recommended lecturer/student ratios associated with quality teaching and learning for the various disciplines studied at the universities. The recommended lecturer/student ratio was compared against what was available at the selected universities. The recommended lecture/staff ratio as per CHE, which was changed to be Commission of University Education (CUE) were such that a programme in Applied Science should have a 1:10 ratio, Arts and Humanities 1:15; Medical and Allied Sciences 1:7, Pure and Natural Sciences 1:10, Social Sciences 1:18 (CHE, 2010). It is common to find that ratios stipulated by CUE are rarely adhered to due to high levels of student enrolments and shortage of lecturers. The shortage of lecturers also makes organizing for tutorial classes a big challenge (Gudo et al; 2011). Gudo et al. 2011 observed that tutorial classes died in public universities. Tutorials and practical lessons are meant to give students deeper understanding of subject matter through critical enquiry in guided debate and practice. Inadequate practical lessons or fieldwork deny the trainees opportunity to link theory learnt in class to practice. Inadequate practical lessons or fieldwork could lead to universities producing graduates with a lot of rote learning and poorly developed critical thinking abilities.

Research is one of the core pillars of the university system. Publication of research findings in reputable journals is one of the ways in which research findings are widely disseminated to stakeholders. According to Chacha (2004) research and publishing by faculty has sharply dropped over the last few years. Due to heavy teaching responsibilities brought about by the rising numbers and the need to part time so as to make some extra money to supplement the meagre pay, faculty are not keen on undertaking meaningful research and publishing their work. Expansion in university students’ numbers negatively affects the quality and quantity of research in public universities in Kenya (Gudo et al; 2011). Gudo also noted that universities experience long term problems of conducting quality research largely due to high workload occasioned by shortage of lecturers and reliance on part time teaching staff. Olukoju (2002) found that there was decline in terms of output, quality and regularity of publications due to decline in scholarly research in Nigeria. Chacha (2004) observed that research and publishing by faculty had sharply dropped, while Olel (2006) found that reduction in the number and quality of research carried out by the teaching staff at universities was due to overloading of staff with mainly teaching and marking duties.

Ramani (2004) observes that university lectures throughout the Commonwealth countries are supposed to teach for a maximum of six hours a week. They are expected to spend the rest of the time in researching, thinking and publishing their findings. In Kenya’s universities, the case is markedly different. Lecturers spend as many as twenty hours every week teaching. Very few lecturers take a leave let alone the much-cherished sabbatical leaves because they are absorbed in teaching. The teaching workload although among the core services of the university it needs to be designed in such a way that it does not deny the academic staff an opportunity to participate in research.

II. RESEARCH METHODOLOGY

Kothari (2004) asserts as cited in Ackoff (1961), a research design is the “arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedures”. The study was conducted by use of descriptive survey design. The study was concerned with analyzing factors which affect quality of education in newly created public universities. This design enabled the researcher to gather information, summarize, interpret and present the findings (Orodho, 2002). Mugenda and Mugenda (1999) gave the purpose of descriptive research as determining and reporting the way things are. Borg and Gall (1989), noted that descriptive survey research is intended to produce statistical information about aspects of education that interest policy makers and educators. The study fits within the provisions of descriptive survey research design because the researcher collected data and reported the way things are without manipulating any variables.

The study was carried out in one newly created public university in Kericho County. The main economic activity within the county is tea and dairy farming. It is a fairly cosmopolitan county with people from neighboring counties working in the tea industry. The study was based at UoK with its staff and students being the target population. Target population is defined as all the members of a real or hypothetical set of people, events or objects to which a researcher wishes to generalize the results of the research study (Borg & Gall, 1989). The study targeted UoK and the respondent involved staff and students. UoK had a total of 47 permanent teaching staff, and a student population of 3020. A total of 115 respondents were selected from the two categories (staff and students) students were sampled.

Sampling means selecting a given number of subjects from a defined population as representative of that population. Any statements made about the sample should also be true of the population (Orodho, 2002). Kothari (2004) observed that the size of sample should neither be excessively large, nor too small. It should be optimum. An optimum sample is one which fulfills the requirements of efficiency, representatives, reliability and flexibility. According to Mugenda and Mugenda (1999), a factor to be considered in determining the sample size is the need to keep it manageable enough to enable the researcher to derive from it detailed data at an affordable cost in terms of time, finances and human resources. Mugenda and Mugenda (1999) further suggest that for disciplined studies, 105 of accessible population is enough. In this study, the population was small and comprised of 14 permanent teaching staff and 101 students. The number was chosen because of its expected usefulness to the researcher in saving time and resources. In picking the sample population, purposive sampling was used to select the institution. The power of purposive sampling lies in selecting the information rich case for in depth analysis related to the central issues being discussed (Mugenda and Mugenda, 1999).
The sampling frame for any probability sample is a complete list of all the cases in the population from which a sample is drawn (Saunders et al., 2007). The study adopted the stratified random sampling. This is because the study population is not homogeneous as it comprised of staff in different disciplines and working in different academic departments. In addition, the students undertake different courses. The goal of this sampling technique was to ensure that these staff and students in different departments are adequately represented in the sample (Mugenda et al., 2003). The researcher then took a stratified random sample of the departments from the five main Schools. The total of number of departments of UoK was 8. A further random sample of staff and students from the sampled departments was done. The researcher then took a random sample of the students under these schools/institutes, and then subjected the random sampled students and staff to questionnaires. The schools/departments comprised of students in different level of studies (second year, third year, and first year).

Data collection instrument which was used was closed and open-ended questionnaire and was self-administered. A questionnaire is considered appropriate for a descriptive design and was used for data collection because it offered considerable advantages in the administration. It also presented an even stimulus potentially to large numbers of people simultaneously and was able to provide the investigation with an easy accumulation of data. Gay (1996) maintains that questionnaires give respondents freedom to express their views or opinions or make suggestions. The questionnaires were administered to the students and academic staff.

According to Orodho (2010), reliability referred to the level to which a measuring instrument provides similar results over a number of repeated trials. Kothari (2004) observe that validity indicates the degree to which instruments measure what they are supposed to measure. In this study the data collection instruments were pretested before use to ensure ambiguities, deficiencies and weaknesses were removed and to ensure consistency and accuracy was achieved. Validity of data indicates the degree to which data collection instruments measure what they are supposed to measure, Kothari, (2004). During pretest questionnaires for this study were adjusted to enhance content validity through consultation with the experts in the area. A pilot test was conducted to a selected sample of 8 respondents who did not form part of the actual sample to test the reliability of the instruments (Kothari, 2004). The findings of the pilot test showed that the calculated Cronbach’s reliability alpha was 0.866 which implied that the questionnaire was reliable. Both primary and secondary data were collected. Primary data consisted of data being collected specifically for the current study and obtained from respondents through questionnaires with both close and open-ended questions. The questionnaire was likert scale in nature. Likert scale is the most widely used scale in survey research where respondents specify their level of agreement to a statement. The data that was collected for the study was checked for completeness, consistency and accuracy. The data was coded and processed using Statistical Package for the Social Sciences (SPSS) version 17.0. The processed data was analyzed using descriptive statistics which included frequencies and percentages. Data were presented by use of tables and figures.

III. RESULTS AND DISCUSSION

The study was guided by three objectives: to determine the perceptions of students and staff on the adequacy of resources for offering quality of education, to assess the interaction taking place between educational inputs and outputs and to establish the challenges in offering quality of teaching staff at the university.

Results indicated in Table 4.1 shows that nearly 46% of students either strongly disagrees (30.7) or disagree (14.9%) that lecture rooms are adequate similar to 67.0% of staff either (14.3%) strongly disagree or disagree 50.0% that lecture rooms are adequate. Only 35.6% of students and 21.4% of staff agreed that lecture rooms are adequate while 18.8% of students and 14.3% of staff were indifferent.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Lecture halls/rooms are adequate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Students</strong></td>
<td><strong>Staff</strong></td>
</tr>
<tr>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>strongly disagree</td>
<td>31</td>
</tr>
<tr>
<td>disagree</td>
<td>15</td>
</tr>
<tr>
<td>undecided</td>
<td>19</td>
</tr>
<tr>
<td>agree</td>
<td>8</td>
</tr>
<tr>
<td>strongly agree</td>
<td>28</td>
</tr>
<tr>
<td>Total</td>
<td>101</td>
</tr>
</tbody>
</table>

Source: Research data, 2016

Analysis of satisfaction level with laboratory equipment was made. Results shown in Table 4.2 indicates that nearly 50% of students either strongly disagree (21.8%) or disagree (27.7%) that laboratories are adequate and well equipped while 57% of staff either strongly disagree (14.3%) or disagree (42.9%) that laboratories are adequate and well equipped. Only 37.7% of students and 21.4% of staff agreed that laboratories are adequate and well equipped. 12.9% of students and 21.4% of staff were indifferent. The interpretation was that the university did not have satisfactory and adequate laboratory equipment for effective teaching and learning.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Laboratories are adequate and well equipped</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Students</strong></td>
<td><strong>Staff</strong></td>
</tr>
<tr>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>strongly disagree</td>
<td>22</td>
</tr>
<tr>
<td>disagree</td>
<td>28</td>
</tr>
<tr>
<td>undecided</td>
<td>13</td>
</tr>
<tr>
<td>agree</td>
<td>15</td>
</tr>
<tr>
<td>strongly agree</td>
<td>23</td>
</tr>
<tr>
<td>Total</td>
<td>101</td>
</tr>
</tbody>
</table>

Further analysis on the perception of availability and adequacy of Computers, laptops and LCDs, results showed that nearly 83% of students either strongly disagree (48.5%) or disagree (34.7%) that ICT facilities are adequate. The same view was shared by nearly 93% of staff (42.9%) strongly disagreed.

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and (50.0%) disagreed that these facilities are adequate. Only 16.8% of students agreed that ICT facilities are adequate while 7.1% of staff were indifferent.

Results on the perceived adequacy and accessibility of internet facilities in the university libraries shows that 71% of students either strongly disagree (25.7%) or disagree (45.5%) that internet facilities are adequate while 64% of staff, (7.1%) strongly disagree or (57.1%) disagree that internet facilities in the library were adequate. Only 9.9% of students and 21.4% of staff agreed that internet facilities are adequate. 18.8% and 14.35% of students and staff respectively were indifferent. The results therefore meant that the university did not have adequate internet facilities for effective teaching and learning.

The researcher sought to establish the adequacy of library facilities such as space, print journals, e-journals, internet and current books in the university. That nearly 86% of students either strongly disagree (29.7%) or disagree (37.6%) that print journals were adequate. Nearly 79% of staff either strongly disagreed (14.3%) or disagreed (64.3%) that print journals are adequate. Only 23.7% of students and 14.2% of staff agreed that期刊 journals are adequate. 9.9% of students and 7.1% of staff remained indifferent. The findings meant that print journals were not adequate in the university.

Investigation was done on the perceived adequacy of print journals in university libraries. Table 4.5 shows that nearly 66% of students either strongly disagree (28.7%) or disagree (37.6%) that print journals were adequate. Nearly 79% of staff either strongly disagreed (14.3%) or disagreed (64.3%) that print journals are adequate. Only 23.7% of students and 14.2% of staff agreed that library journals are adequate. 9.9% of students and 7.1% of staff remained indifferent. The findings meant that print journals were not adequate in the university.

Analysis was done on the perceived satisfaction with availability of current books (2005 - 2010). Responses in Table 4.7 shows that nearly 58% of students either strongly agree (13.9%) or agree (43.6%) that library books were current and adequate. Nearly 79% of staff either strongly agree (14.3%) or agree (64.3%) that they were satisfied with the adequacy of current books and journals. Only 42.6% and 21.4% of students and staff respectively, disagreed that current books are inadequate. This therefore meant that quality teaching and learning in university was not negatively affected by shortage of current books and journals because research findings indicate that they are adequate.

### Table 3

<table>
<thead>
<tr>
<th>Current books available</th>
<th>Students</th>
<th>Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>strongly disagree</td>
<td>8</td>
<td>7.9</td>
</tr>
<tr>
<td>Disagree</td>
<td>35</td>
<td>34.7</td>
</tr>
<tr>
<td>undecided</td>
<td>44</td>
<td>43.6</td>
</tr>
<tr>
<td>Agree</td>
<td>14</td>
<td>13.9</td>
</tr>
<tr>
<td>strongly agree</td>
<td>8</td>
<td>7.9</td>
</tr>
<tr>
<td>Total</td>
<td>101</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The study also sought to establish if examination processes were effective in the university and whether grades obtained by the students in an examination reflect their individual academic ability. Analysis was done to establish if examinations in the university are externalized. Results from staff in table 4.15 indicate 71.3% of staff either strongly agree (16.8%) or agree (54.5%) that university examinations are externalized. Only 29(28.7%) were indifferent. This findings leads to the conclusion that examinations are generally externalized in the University. The responses in table 4.16 indicate that nearly 60% of students either strongly agreed (8.9%) or agreed (50.5%) that there were cases of examination malpractices. Nearly 79% of staff either agreed (14.3%) or strongly agreed (7.1%) that there were cases of exam malpractices. Only 34.6% students and 14.3% of staff respectively disagreed that examination malpractices are not in existence. 5.9% and 7.1% of students and staff remained indifferent.

From the analysis above that sought to determine the perceptions of students, and staff on adequacy of resources for offering quality of education in University of Kabianga, it was interpreted that the university did not have adequate learning facilities for effective teaching and learning. This therefore means that the quality of teaching and learning is negatively affected by inadequate learning facilities in the University such as Library resource, Laboratories, lecture rooms/halls and ICT facilities/resources. Ministry of Education, Science and Technology (Republic of Kenya, 2003, pp.xiv, 61, 81) noted that the nature of physical facilities is important in determining the quality of university education in that lack of adequate physical facilities such as lecture rooms, computers, laboratories and laboratory equipment negatively affects the quality of teaching and learning. Shortage of physical facilities in public universities in Kenya is well documented. World Bank (2000) and Cheboi (2001) noted that financial resources directed to university education were inadequate. Cheboi (2006) observed that shortage of facilities affected the quality of higher education. According to Okwakol (2008) most African universities do not have adequate physical facilities such as lecture rooms, office, and library and laboratory spaces to provide a suitable learning and teaching environment. She noted that 55% of laboratory equipment in most departments in universities was not in a state in which they could be used to carry out experiments. The net effect of this scenario was that only about half the experiments were done. Report of The Public Universities Inspection Board (Republic of Kenya, 2006) noted that accelerated growth in student numbers in the public universities had not been matched by expansion of physical facilities and academic infrastructure and that some of the existing infrastructure was inadequate, dilapidated and in bad state of despair.

Analysis done to determine the adequacy of library resources such as print journals, current book, internet facilities indicates that library resources in University of Kabianga are inadequate and therefore negatively affected the quality of teaching and learning in the university.

A study by Ndethiu (2007) at Kenyatta University found that lack of adequate reading resources posed a challenge to the promotion of students reading habits. Inadequate use of internet and general lack of reading space were important constraints to students reading. According to Eshiwani (2009) our universities are forced to work under adverse conditions; lack of resources for non-salary academic expenditure, such as textbooks, journals, teaching and research equipment and maintenance of such
equipment. He asserts that the situation has resulted in a lowering of academic standards and of quality of graduates. Graduates are deficient in written communication and technical proficiency which make them unfit for the market.

Analyses done to determine adequacy of ICT facilities and resources showed that ICT resources facilities and resources in University of Kabinaga are inadequate. This therefore has an impact on the perception of education being offered in the University. Report of The Public Universities Inspection Board (Republic of Kenya, 2006) noted that quality and quantity of teaching and learning materials particularly information technologies impact in a very significant way on the quality of teaching and research. Okwakol (2008) noted that a computer is increasingly becoming the major notebook, textbook, dictionary and storage facility for information for students in institutions of higher learning. She noted that universities that fail to utilize the benefits of the digital age-computer assisted learning, web connectivity and networked learning cannot offer quality education. Library facilities and information systems in almost all universities are antiquated. Manyasi (2010) while studying how using information technology could increase access to higher education through distance learning in Kenya found that institutions of higher learning lacked the necessary technology. The institutions had only a few computers, which were used by lecturers to access internet services. Lecturers lacked instructional competencies and information design for distance learning associated with delivery of high quality services. Advances in Information Technology could provide solution for the demand in university education in Kenya. However, there was insufficient institutional preparedness. Apart from inadequate space, the university did not have satisfactory internet provision for the learners. This was a great impediment to provision of quality teaching and learning. As was noted earlier, computers and internet services are integral ingredients to modern day higher education without which quality of education suffers.

Analyses done to determine perception of staff and students on adequacy and efficiency of Examination processes and Facilities University of Kabianga, the researcher established that Examination processes and facilities are adequate. This therefore means that the integrity of examinations offered by the University is guaranteed hence upholding the quality of education is offering. According to Birungi (2006) how students are assessed for what they have learnt is an important element of quality assurance for the regulatory agencies and for individual universities. Cheating in examinations is an opportunistic behavior attributed to inadequate student preparation and lack of confidence to face examinations. Given that majority of students admitted to public universities obtained higher entry grades (Gudo&Olel, 2011), examination cheating is attributed to lack of adequate control measures taken against examination cheating and remote chances of detection. It was therefore inferred that frequency of students cheating in the university was lowering quality of its examinations and the education provided.

Analysis was done to establish whether teaching staff are adequate for all courses in the university. Responses in Table 4.8 showed that 71% of students either strongly disagreed (17.8%) or disagree (53.5%) that there were enough lecturers while 64 % of staff either strongly disagree (7.1%) or disagree (57.1%) that lecturers were adequate for all courses. Only 16.9% and 28.6% of students and staff respectively agreed that lectures are enough for all course. 11.9% and 7.15 of students and staff remained indifferent.

The researcher also sought to know if the lecturers in the university are qualified and experienced; the responses in table 4.9 showed that72% of students either strongly agreed (24.8%) or agreed (47.5%) that teaching staff are qualified and experienced. 71% of staff either strongly agreed (21.4%) or agreed (50.0%) that lecturers are qualified and experienced. Only 19.8% of students and 14.2% of staff disagreed that teaching staff are not qualified and experienced whereas 7.9% and 14.3% of students remained indifferent.

Asked whether tutorial classes were offered and if they were effective, the responses in Table 4.10 showed that nearly 68% of students either strongly agreed (32.7%) or agreed (34.7%) that there was effective teaching and tutorial classes in the university. Nearly 79% of staff either strongly agreed (57.1%) or agree (21.4%) that teaching and tutorial were available and effective. 7.9% of students and 14.35 of staff respectively disagreed that teaching and tutorial classes were not effective.24.8% and 7.1% of staff were indifferent.

Tutorials and practical lessons are meant to give students deeper understanding of subject matter through critical enquiry in guided debate and practice. Inadequate practical lessons or fieldwork deny the trainees opportunity to link theory learnt in lecture halls and the field of work. According to Waituru (1999), lack of tutorial classes could lead to universities producing graduates with a lot of rote learning and poorly developed critical thinking abilities. The researcher also sought to find out the views of lecturing staff regarding the quality of research at the university with regard to opportunities provided to participate in research activities with the aim of improving education offered by the University.

Attempt was made to find out if teaching and marking consumes a lot of time hence affecting research activities; results indicated in Table 4.12 shows that79% of staff either strongly agree (7.1%) or agree (71.4%) that the high workload occasioned by shortage of lecturers and reliance on part time teaching staff reduced their time for conducting quality research. 21.4% staff however disagreed that teaching and marking consumes a lot of time hence enough time to conduct research.

The above findings compare to Olukouju (2002) who found that there was decline in terms of output, quality and regularity of publications due to decline in scholarly research in Nigeria. Chacha (2004) observed that research and publishing by faculty had sharply dropped, while Olel (2006) found that reduction in the number and quality of research carried out by the teaching staff at universities was due to overloading of staff with mainly teaching and marking duties. According to Eshiwani (2009) decline in government funds of the universities has adversely affected the quality of teaching and research as well as general working conditions in universities.

Recreation activities like Sports are one of the most important student activities and are linked to academic achievements in students. Students were therefore asked to state their level of satisfaction with the sporting facilities provided by the university. Analysis on adequacy of recreational facilities in shows that 72% of students either strongly disagreed (52.5%) or
disagreed (19.8%) that recreational facilities are adequate. 64% of staff either strongly disagreed (14.3%) or disagreed (50.0%) that creational facilities available in the university are adequate. 16.8% of students and 28.6% of staff however agreed that recreational facilities are adequate. 10.9% of students and 7.1% of staff were indifferent.

This was interpreted to mean that the university did not provide adequate sporting facilities. Fox, et al (2010) found that there were positive associations between involvement in physical activities and academic achievement among students. Results from a study by Taylor, et al (2010) indicated that participation in sports enhanced school adjustment, moral adjustment, self-esteem and more positive self-concept among students. The results also indicated that students participating in sports reported higher grades and more motivation for further studies than their non-sports counterparts. It was therefore inferred that inadequate provision of sporting activities in the university negatively influenced the quality of teaching and learning.

Students were also asked to indicate their level of satisfaction with guidance and counseling services at the university. Results in table 4.14 indicate that nearly 47% of students either strongly agreed (20.8%) or agreed (25.7%) that there was adequate provision of counseling services. 57% of staff either strongly agreed (28.6%) or agreed (28.6%) that the university provide adequate counseling services. Only 48% of students disagreed that counseling services are inadequate while 43% as well as 43% staff. 5% of students however were indifferent.

IV. CONCLUSIONS AND RECOMMENDATIONS

The findings show that staff and students perceive the University to have inadequate resources for offering quality education. The study established that 46.0% of students perceive that lecture rooms are inadequate similar to 67.0% of staff who also perceive that lecture rooms in the University were inadequate. The study also established that 50% of students perceived that laboratories were inadequate and well equipped while 57% of staff were of the same opinion that laboratories in the University are inadequate and well equipped. The interpretation was that the university did not have satisfactory and adequate laboratory equipment for effective teaching and learning. The finding on perception of adequacy of ICT resources and facilities indicates that 83% of students perceive that ICT facilities are inadequate. The same view was shared by 93% of staff that these facilities are inadequate. The study further established that library facilities such as space, print journals, e-journals, internet and current books were inadequate in the university. 86% of students and 50% of staff were of the same opinion library facilities and resources were inadequate.

To establish the extent to which University inputs like, lecturers’ qualification and experience, library resources and facilities, ICT facilities and resources, laboratory facilities, instructional material affect the quality of education in University of Kabianga, the results from the study indicate that there is negative interaction of educational inputs brought about by inadequacy of lecture halls, library resources, laboratories and equipment, ICT facilities and student welfare support. The findings established that 71% of students felt that teaching staff in the University were inadequate. 64% of staff also felt that lecturers were inadequate for all courses. It also established 72% of students and 71% of staff felt that lecturers in the university are qualified and experienced. This finding however can be argued that quality of academic staff alone is not sufficient for a university to offer quality education. The finding also established that 68% of students and 79% of staff believe that there was effective teaching and tutorial classes in the university while 7% of students and 24.8% of staff did not believe that teaching and tutorial classes were effective in the University.

It was also established that 64.3% of staff felt that the time and funds allocated for research activities was inadequate hence affecting the output and quality of research carried out in the University. 79% of the staff also felt that the high workload occasioned by shortage of lecturers reduced their time for conducting quality research. This finding of the study supports earlier studies by Waituru (1999), Maria et al (2003) and Mutisya (2010) that singled out shortage of lecturers as serious threat to offering quality university education. Despite the inadequacy of teaching facilities, the teaching at the University is of high quality because of experienced and qualified teaching staff. However, quality of academic staff alone is not sufficient for a university to offer quality education.

The findings indicate that there are a number of challenges that affects quality teaching and learning in the University. The findings show that the University is struggling with inadequate number of lecturers for all courses, inadequate facilities to support quality teaching and learning, inadequate funding for research activities, inadequate offices for staff and inefficient management of external examination processes. The inadequacy of all these key resources and processes can compromise quality education offered by the University. This finding corroborates earlier studies by Waituru (1999), Maria et al (2003) and Mutisya (2010) that singled out shortage of lecturers as serious threat to offering quality university education. The finding also is in support of Gudo et al (2011) observation that external examination in universities is dysfunctional and facing several challenges that compromises quality.

Ideally, quality is achieved by carrying out the core function well. According to Bowden and Marton (1998, ch.1), these core functions, for a university, are teaching, research and community service. They argue that the core process in all these functions is learning. When it is carried out well at all levels of participants it becomes the defining element of quality in a university. Learning prepares the students for handling the situation in unknown future based on the current knowledge. This study sought to assess quality of education in University of Kabianga being a newly established public University in Kenya. In particular the study sought to determine the perceptions of staff and students’ on adequacy of resources for offering quality of education assess the interaction between the educational input and output and establish the challenges in offering quality education in the University.

The study established that the quality of Education in University of Kabianga is negatively affected to a larger extent due to limited available resources to support quality teaching and learning. Shortage of physical facilities that support teaching and learning for example library resources, ICT facilities/resources, laboratories, lecture rooms affects the perception of staff and
students on the quality of education being offered in the institution. The assessment made on the interaction of educational inputs and output shows that the University in its quest to offer quality education, has been greatly affected by inadequate lecturers for all courses being offered, inadequate library resources for staff and students and inadequate laboratories and lecture rooms for learning.

The biggest challenge the University is experiencing in its quest to offer quality teaching is inadequate funding by the Government to enable it support key operations that will ensure that adequate learning resources are provided. University of Kabianga is within the new global market, which is characterized by increasing demand in university education, rapid information change, and intense information flows. The University is forced to emerge as a newly established institution driven by the commercial imperative of market led forces, yet the University’s strategies for resource utilization are embedded in government policies which sometimes affect resource distribution to processes and activities that support quality teaching and learning. This therefore has an effect on recruitment of teaching staff to ensure that all courses being offered in the University are well covered by qualified and experienced staff, and limits the research activities being conducted by the faculties.

Another challenge established is inefficient management of university examinations with regard to external examination processes. Much as the process was found to be functional, the issues that were highlighted to be challenging can affect the whole process and compromise on the quality of examinations being offered by the University in that examination processes should be clear, adequate and transparent because outcomes of assessments have a profound effect on students’ careers and is also one of the ways through which a University can tell whether a course / programme objectives are being met or not, hence, high or low quality education.

In conclusion the study has succeeded in presenting data that should serve as a benchmark against which future studies can be compared. In addition, it has added useful insights to paucity of literature towards quality of education in newly established public universities in Kenya. University of Kabianga is within the new global market, which is characterized by increasing demand in university education, rapid information change, and intense information flows. The University is forced to emerge as a newly established institution driven by the commercial imperative of market led forces, yet the University’s strategies for resource utilization are embedded in government policies which sometimes affect resource distribution to processes and activities that support quality teaching and learning.

Quality teaching plays an important role in achieving Academic Excellence and provides a competitive edge so that the students can qualify for jobs in the best Companies of the World to accommodate increased demand of University education in Kenya, newlycreated universities would first require that the capacity of teaching staff is enhanced to adequately integrate technology to facilitate quality of delivery within a shorter time and greater distance than it is today. Computers and internet services are integral ingredients to modern day education. The universities should be assisted to acquire these facilities for teaching and learning.

To achieve acceptable quality standards and mass university education in Kenya, there must be collaboration between the government and the private sector. The newly created universities should be encouraged to partner with private sector in putting up physical facilities for accommodation, laboratories and lecture halls within the campuses. Under Build, Operate and Transfer (BOT) arrangements, universities can liaise with private investors in the housing sector to construct some of the required infrastructure which the investors operate for some time to recover costs before surrendering the same to the respective universities. Experience has shown that the government support to public universities is not enough to finance infrastructure development to match the increasing number of students. Public private partnership should include government incentives to private universities to admit more students through a reorganized centralized student admission and financing for students admitted to public and private universities. This requires rethinking the management of university students’ loan scheme to meet tuition fees of students attending both public and private universities without any discrimination except for the amounts of loan available for the various courses of study.

Another opportunity to be exploited is for universities to collaborate with middle level colleges in an arrangement whereby universities concentrate their effort to production of degree holders while middle level colleges produce diploma and certificate holders. These colleges should align their courses to degree programmes of universities of their choice. The curricula of the colleges should be carefully designed to allow for academic advancement including pursuit of degree studies. This arrangement will promote growth of the middle level colleges and release lots of space in universities for admission of degree students.

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Selected Dynamics Influencing Adoption of Integrated Tax Management System By Small And Medium Taxpayers: A Case of Bomet County, Kenya

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Abstract- Tax collection is an important means of raising revenue of any country and this determine its economic position. The adequacy of revenues allows the government to support its operations ranging from administrative activities; infrastructure development and service provision. In the first half of the last financial year, KRA reported tax collection below its target. Online iTax was introduced to replace the Integrated Tax Management System (ITMS) previously used by Kenya Revenue Authority. Like iTax, ITMS was unable to handle heavy traffic and had less functionality, forcing the taxman to abandon it for the much more versatile system. This study sought to assess the selected dynamics that influence adoption of iTax by selected Small and Medium Taxpayers, focusing on those operating within Bomet County. The objectives for this research are; To assess the extent to which iTax system has been adopted by various SME’s in Kenya, how do the SME taxpayers level of technical skill influence adoption of iTax system and establish the extent to which availability of internet influences adoption of iTax by SME taxpayers. The study was guided by a combination of Innovation Diffusion Theory (IDT), Technology Acceptance Model (TAM) and the theory of Reasoned Action (TRA). A descriptive survey design was used. The study population comprised of registered wholesaler and retail traders in Bomet County out of which 30% of it was selected as the target representative sample. Data was collected using self-administered questionnaires. The collected data was analyzed using regression model and correlation to determine the relationship between the dependent variable and the independent variables of the study. This was done by aid of Statistical Package for Social Scientist software (version 20). Findings from the study showed availability of internet services was strong and significant r (0.682); p ≤ 5. Ease of use of iTax was the second factor in terms of strength r (0.418); p ≤ 5 and significance of relationship with the adoption of iTax system which followed the availability of internet. Whereas the relationship between technical skills and the adoption of iTax was not very strong in relation to the other variables, it was positive r (0.349); p ≤ 5 were presented using tables. The study recommends more ICT infrastructures for easy internet accessibility and trainings on use of iTax system.

Index Terms- Integrated tax management system, Bomet, Kenya

I. INTRODUCTION

Information Communication Technology (ICT) applications have evolved from tools to increase policy effectiveness, cut costs and realize efficiencies, to being more interactive and stakeholder focused (Snellen, 2005). Specifically, in the early 1990s, with the emergence of the internet, email and intranet combined with “the growth of customer relationship management”, and increased public demands for ‘service quality’ and new work methods, the scope of modernization of the public sector through the application of ICT expanded electronic provision of government services and activities (Bovaird, 2003). Many governments across the world have invested heavily in ICT/e-governance for the past two decades. ICT has been utilized extensively in the provision of services such as birth and car registration, company licensing, renewal of driving licenses, application of pass ports and in the remission of tax returns. One aspect of e-governance which tends to be most widely utilized is electronic tax system commonly abbreviated as iTax. According to Hwang (2000), iTax systems can be defined as an electronic tax-filing system which utilizes both internet and 2D bar-code systems of filing. This new system is rapidly replacing the traditional manual way of filling income tax returns.

The introduction of Internet filing has contributed to fundamental development in the process of revenue collection. The success of iTax can be influenced by various factors which may vary from one nation to another. Existing reports are pointing out that most tax payers have been slow to embrace this system of filing returns. For example, in the US, which introduced e-filing in 1986, it is reported that only 52% of its taxpayers had adopted e-filing in 2007 (The Internal Revenue Service, 2007). It is reported that only 1.25 million taxpayers in Malaysia had adopted e-tax filing system and had filed their tax return through it four years after it was introduced in 2009. This signals the rate at which tax payers are slow to adopt iTax as a method of filling tax returns without bringing into light the root causes of such responses.

In Kenya, there are potential 11 million formal tax payers. Whereas iTax is expected to be an easily accessible online tax submission, out of this number, only 2 million filed their taxes through the online system by June 30, 2015 in 2014/2015 financial year (KRA, 2015). This translates to 18% of the tax payers in the country. This low adoption of iTax is unexpected. Consequently, this study sought to establish the factors
influencing the adoption of the online tax filing system by the Kenyan medium small tax payers by using a case study of Bomet County.

The ever growing need to provide more and better services to the public has led to the need to increase revenue collection in Kenya. This has occasioned the introduction of iTax systems. This was meant to improve the accessibility of taxation services to the tax payers all the time from anywhere in a bid to reduce costs of tax accumulation and to improve tax compliance. Despite the efforts made by the government to employ such kind of technology, tax compliance levels are still far below the set national targets. In view of this, less in terms of research has been done on the adoption of iTax by Kenyan tax-payers. Overall, past studies identified little findings on the factors that influenced adoption of iTax system by small and medium tax payers in the service industry in Kenya. Those findings failed to report on whether the tax-payers have been provided with the necessary taxation education by the revenue authorities. This study therefore seek to fill this gap by assessing the factors influencing adoption of the iTax system by selected small and medium tax payers in the service industry in Kenya by using one County as a case study.

Chigona (2008) used innovation diffusion theory (IDT) theory framework to explain communal computing facilities adoption among the urban poor Cape Town South Africa. Lee, Hsieh, and Hsu, (2011), explored the behavioral intentions to use the e-learning system by combining the innovation diffusion theory (IDT) with the technology acceptance model (TAM).

Buabeng-Andoh (2012) studied the factors influencing teacher’s adoption and integration of information communication technology in teaching by looking at personal, institutional and technological factors. Talukder (2012) modeled the understanding of factors affecting the adoption of technological innovation by individuals around the organizational factors; individual factors and the social factors. The current study contributes to the adoption of innovation literature by examining innovation adoption through a combined theoretical approach. The study combines the innovation diffusion theory (IDT), technology acceptance model (TAM) and the reasoned theory of action (TRA) to present an extended innovation adoption model. On the context, several studies have been carried out at Kenya Revenue Authority to determine the factors that influence adoption of technological innovations. Obae (2009) studied the use of technological innovation at KRA to achieve turnaround strategy. This study was only based on the internal employees not the clients.

Oketch and Mburu (2011), in their research ‘Analysis of responsiveness of tax revenue to changes in national income in Kenya 1986-2009’, observed over the years, the Kenyan government had continued to experience budget deficit. This had been partly attributed to the inability of the tax system to generate sufficient revenue to finance public expenditure. Inadequacy of tax revenue to finance public expenditure had largely been attributed to lack of responsiveness of tax revenue to changes in national income. Similarly, Kipsang and Rotich (2014) studied the adoption of electronic procurement system at

II. RESEARCH METHODOLOGY

A descriptive survey design was adopted for this study. A descriptive survey design was considered appropriate for this study as it describes characteristics associated with the subject population, and in particular factors that make them behave the way they do. Cooper (2003) asserts that descriptive design discovers and measures the cause and effect of relationships between variable. Mugenda (2003) state that a descriptive research determines and reports the way things are and attempt to describe possible behavior, attitude, values and characteristics of such things.

The study used a descriptive design because it enables the researcher to collect a large quantity of in-depth information about the population being studied. A survey design was appropriate as the data required for analysis needed was collected from a large population, of SME taxpayers operating in Bomet County. Descriptive survey is also appropriate because it was difficult to observe characteristics of each SME taxpayer. The unit of analysis for the study was every individual taxpayer that has used the iTax system and hoping to re-use it again.

The focused of the study was on SME Taxpayers operating in Bomet County. The selected location borders Kericho, Narok, Kisii and Masai Mara counties of Kenya. The county was selected in this study of the adoption of iTax system as a representative sample of the rest of the counties in relation. The population of interest for this study was 1543 registered Medium and Small Taxpayers from Bomet County which comprised of: 496 are wholesale and retail trade, 467 in service providers, 338 in agriculture and manufacturing Activities, and 242 in financing and construction businesses.

Sampling is a means of selecting a part of a group from a population to represent the characteristics of the entire group or the population of interest. The of used sample size give accurate information, and reduces the length of time needed for research and cuts costs. Kenya has 47 counties and one county, which is Bomet, was selected as a representative sample. A sample size of 149 out of 496 SME taxpayers was selected for the study since the registered number of wholesalers and retail traders is high among the registered SMEs. This represents 30% of the SME taxpayers in the wholesale and retail trade. According to Blanche, Durrheim & Painter (2008) in a population of up to 1,000, a sample size of 30% is considered sufficient.

The study employed both primary and secondary data collection instruments. Secondary data was collected from KRA and Ministry of Trade office in the County. Primary data was collected using questionnaire and in depth interview method. The questionnaire adopted was both structured and closed questions. Questionnaires were appropriate for a large population as they involve the respondents responding to the questions themselves and they are precise and time saving (Kendall, 2008). The use of interview method of data collection ensures that the questions were understood thus minimizing the risk of collecting incomplete and wrong information as it is with questionnaires particularly when people were unable to understand the questions properly. This data collection method was considered by the researcher as appropriate in providing safe basis for generalization of findings.

According to Kothari (2004), validity is the degree to which an instrument measures what it is supposed to measure.
Validity therefore, the term refers to the extent to which an instrument asks the right questions in terms of accuracy. The content validity of the research instrument for this study was determined through piloting in Kericho County, where the responses of the subjects were checked against the research objectives. For a research instrument to be considered valid, the content selected and included in the questionnaire must be relevant to the variable being investigated (Kothari, 2004). Reliability of an instrument is the measure of the degree to which a research instrument yields consistent results or data after repeated trials (Cooper, 2003). To test the reliability of the questionnaire as a research instrument, Cronbach's alpha was used. Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. Pilot tests on 5 respondents who were not in the main study but similar characteristics in Kericho County were used to test validity and reliability of the instruments.

The questionnaires were administered to the respondents directly by the researcher because most businesses in the study area are in close proximity to each other. For those respondents who were not available for fill the questionnaire immediately they were given some time to fill at their appropriate time and the researcher will collect the filled questionnaires later. The interviews were conducted by the researcher personally at a time and place convenient to the selected owners of wholesalers and retail traders to provide an environment in which the respondents will feel free to participate.

Analysis of the data from fully completed questionnaires was done to ensure that the data is accurate and consistent with other information gathered. Pre-processing of collected data was done by editing the data to detect errors and omissions immediately after questionnaires are received. Thereafter, coding of responses was done, data classified on the basis of common characteristics and attributes. The process data were assembled, statistically analyzed and tabulated in form of statistical tables to allow for further analysis. Regression analysis and correlation were used in data analysis in this study. The Statistical Package for Social Sciences (SPSS) version 20 was used to aid in the statistical analysis.

This research was endeavoring to obtain an informed consent from the respondents before undertaking data collection from the field. The objectives of the research was explained and made known to the respondents so as to solicit their informed consent. Respondents were assured of anonymity and high level of confidentiality of the information provided by respondents through interview or questionnaires. An introduction letter showing the purpose of the research was attached to the questionnaires and interview guides.

III. RESULTS AND DISCUSSIONS

The study sought and obtained details about the gender of the respondents in Bomet County for purposes of knowing their number. Findings indicated that 61.7% (92) of respondents were Male and 38.3 (57) of respondents were Female aged between 23-35 years. 10.4% (11) of women were below 22 years. The data further indicates that 16% (17) of women were aged between 36 and above years.

Regarding the age brackets of the respondents, the study established that most of the respondents were below the age of 30 years as shown in Table 1

<table>
<thead>
<tr>
<th>Age of respondents</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-30 years</td>
<td>81</td>
<td>54.4</td>
</tr>
<tr>
<td>31-40 years</td>
<td>43</td>
<td>28.9</td>
</tr>
<tr>
<td>41-50 years</td>
<td>20</td>
<td>13.4</td>
</tr>
<tr>
<td>51 years and above</td>
<td>5</td>
<td>3.4</td>
</tr>
<tr>
<td>TOTAL</td>
<td>149</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source 2016

The findings in Table 4.2 show that people with 21 and 30 years stands 54.4%, 31 and 40 years are 28.9%, 41 and 50 years are 13.4% and 51 years and above represent 3.4% this suggest that majority of the respondents were young people (54.4%) aged between 21 and 30 years. It was also necessary to establish the academic qualifications of the respondents as this would have bearing on the quality of the responses and ultimately influence the outcome. Table 4.3 shows the distribution of respondents as per their education levels.

<table>
<thead>
<tr>
<th>EDUCATION LEVEL</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary level</td>
<td>12</td>
<td>8.1</td>
</tr>
<tr>
<td>Secondary level</td>
<td>111</td>
<td>74.5</td>
</tr>
<tr>
<td>College level</td>
<td>18</td>
<td>12.1</td>
</tr>
<tr>
<td>University level</td>
<td>8</td>
<td>5.4</td>
</tr>
<tr>
<td>TOTAL</td>
<td>149</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source 2016

Table 4.3 shows that those with Primary level (12) which represents 8.1%, Secondary level (111) which represent 74.5%, College level 18 which represents 12.1% and University level 8 which represent 5.4%. The majority of the respondents are Secondary level Holders.

The study also sought to find out the type business Table 3 shows the type of businesses of the respondents, whether wholesale or retail.

<table>
<thead>
<tr>
<th>Type of business activity</th>
<th>Frequency</th>
<th>Percent</th>
<th>Percent %</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole sale</td>
<td>39</td>
<td>26.2</td>
<td>26.2</td>
<td>26.2</td>
</tr>
<tr>
<td>Retail</td>
<td>110</td>
<td>73.8</td>
<td>73.8</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>149</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Survey data 2016

The researcher found it of importance to ask the respondents to indicate their business’ average annual turnover, as this is the major factor that identifies the category under which
a taxpayer falls consequently determining whether the respondents can be classified as Medium and Small Taxpayers. Table 4 shows the results of the findings.

<table>
<thead>
<tr>
<th>Description of income of the respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>Below 500,000 per year</td>
</tr>
<tr>
<td>500,001-1,000000</td>
</tr>
<tr>
<td>1,000,001-2,000,000</td>
</tr>
<tr>
<td>2,000,001-3,000,000</td>
</tr>
<tr>
<td>3,000,001 and above</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Source 2016

Respondents with an annual turnover of over Ksh3 million accounted for 42%, followed in a distance by 16.7% who revealed they had annual turnover of below Ksh500, 000 while 14.6% indicated that their annual turnover is between Ksh2,000,000 and Ksh1 million, and 12.6% said their turnover ranged between Ksh1 million and Ksh2 million. The study further revealed that 11.6% had an annual turnover of between Ksh2 million and Ksh3 million. It can therefore be deduced that most respondents had an annual turnover of over Ksh3 million but less than Ksh 300 million and thus can correctly be categorized as Medium and Small Taxpayers.

The study sought to determine how regularly the respondents access internet facilities. The use of iTax is dependent on access to internet and therefore the researcher sought to determine whether the respondents do have access to internet and how regularly. Most of the respondents (77.2%) access the internet on a daily basis, followed by 14.8% who do on a weekly basis. The remainder, 8.0% access the internet at least on monthly basis. It can therefore be deduced that the majority of taxpayers in Bomet County access internet on a daily basis and are therefore in a position to access iTax, an online service, with ease.

When the respondents were asked if they would like to use iTax system frequently 54(36.2%) of the respondents strongly agree, 23(15.4%) of the respondents agree whereas 42(28.2) of the respondents were neutral. From the results it can be concluded that majority

<table>
<thead>
<tr>
<th>Would like to use iTax system frequently</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>strongly disagree</td>
</tr>
<tr>
<td>Disagree</td>
</tr>
<tr>
<td>Neutral</td>
</tr>
<tr>
<td>Agree</td>
</tr>
<tr>
<td>strongly agree</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Source 2016

In the below table, when the respondents were asked whether iTax is complicated to use 24(16.1) of the respondents strongly agree, 60(40.3) of the respondents agree, 23(15.4) of the respondents were neutral, 38(25.5) while 41(27.5) of the respondents were positive.

<table>
<thead>
<tr>
<th>iTax is complicated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>strongly disagree</td>
</tr>
<tr>
<td>disagree</td>
</tr>
<tr>
<td>Neutral</td>
</tr>
<tr>
<td>Agree</td>
</tr>
<tr>
<td>strongly agree</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

Respondents were asked if it is easy to use iTax 16(10.7) of the respondents strongly agree, 54(36.2) of the respondents agree, 41(27.5) of the respondents were neutral, 34(22.8) of the respondents disagree 4(2.7) of the respondents strongly disagree. When asked if they need somebody to help in use of iTax system, 16(10.7) of the respondents strongly agree, 90(60.4) of the respondents agree, 31(20.8) of the respondents were neutral, 12(8) of the respondents were negative about the findings.

When the respondents were asked if most of the people they can learn easily to use iTax the respondents were negative, 33(22.1) of the respondents were neutral while 52(34.9) of the respondents accepted. When asked if they were comfortable using iTax only 4(2.7%) of the respondents strongly disagree, 53(35.6) of the respondents disagree, 40(26.8) of the respondents were neutral, 42(28.2) of the respondents agree whereas 10(6.7) of the respondents strongly agree.

Majority of the respondents indicated that they need to be taught many times to use iTax 50(33.6) of the respondents disagree, 30(20.1%) of the respondents were neutral while 69(46.3%) of the respondents were positive about the findings.

A correlation analysis was done based on the findings of this study. The intention of the analysis was to establish whether there was any relationship between the adoption of iTax by the taxpayers in Bomet County (as the dependent variable) with the independent variables (which were the availability of internet services in the county, the ease of using iTax and the technical skills required in the use of iTax). A summary of the correlation findings are shown in Table 7.

<table>
<thead>
<tr>
<th>Table 7 Correlation Matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent of influence, Y</td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td>Availability of internet services, X1</td>
</tr>
<tr>
<td>Ease of use, X2</td>
</tr>
<tr>
<td>Technical skills, X3</td>
</tr>
</tbody>
</table>

As shown in the study findings which were summarized in Table 4.28 above, the relationship between the adoption of iTax and availability of internet services was strong and significant r(0.682); p ≤ 5. Ease of use of iTax was the second factor in
terms of strength \( r (0.418); p \leq 5 \) and significance of relationship with the adaptation of iTax system which followed the availability of internet. Whereas the relationship between technical skills and the adoption of iTax was not very strong in relation to the other variables, it was positive \( r (0.349); p \leq 5 \).

As shown in the values \( [F (3, 145) = 56.939, p < 5] \) arrived at from the analysis done on Table 8 there is a significant relationship between predictor variables and dependent variable.

### Table 8
Analysis of Variance

<table>
<thead>
<tr>
<th>Source 2016</th>
<th>Sum of Squares</th>
<th>Mean of F</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>92.950</td>
<td>3</td>
<td>30.983</td>
<td>56.939</td>
<td>.000*</td>
</tr>
<tr>
<td>Residual</td>
<td>78.902</td>
<td>145</td>
<td>.544</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>171.852</td>
<td>148</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Dependent Variable: Extent of influence b. Predictors: (Constant), technical skills, availability of internet services, ease of use

The findings of this study were subjected to regression analysis relating to the coefficient and the ratio. The results of this analysis are shown in Table 4.32 below. A t - ratio of 3.3 achieved in this analysis means that the other variables which influence the adaptation of iTax system in Bomet County and were left out in the model also positively determine the adoption to a significant extent.

### Table 9
Regression Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coef'</th>
<th>Std. Error</th>
<th>t</th>
<th>Sig.</th>
<th>B</th>
<th>Std. Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>.879</td>
<td>.271</td>
<td>3.246</td>
<td>.001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>availability of internet services</td>
<td>.425</td>
<td>.045</td>
<td>.587</td>
<td>9.523</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>ease of use</td>
<td>.154</td>
<td>.065</td>
<td>.146</td>
<td>2.366</td>
<td>.019</td>
<td></td>
</tr>
<tr>
<td>technical skills</td>
<td>.221</td>
<td>.056</td>
<td>.227</td>
<td>3.959</td>
<td>.000</td>
<td></td>
</tr>
</tbody>
</table>

a. Dependent Variable: Extent of influence

### Source 2016

The findings shown in Table 4.32 concur with the findings by Thairu (2014) that there is a relationship between ease of use of iTax which is indicated by a t-ratio of 2.366 in this study to training offered by KRA so as to make the use of online tax filing system to be easy for the taxpayers. Whereas this factor was not part of the model, it largely affects the second factor and consequently affects the adaptation of iTax.

### IV. CONCLUSIONS AND RECOMMENDATIONS

The purpose of the study was to investigate selected dynamics influencing adoption of iTax system by small and medium taxpayers in Kenya. The study focused on selected SMES in Bomet County. The study was guided by three specific research objectives: To assess the extent to which iTax system has been adopted by various SME’s in Kenya, how do the SME taxpayers level of technical skill influence adoption of iTax system and establish the extent to which availability of internet influences adoption of iTax by SME taxpayers. The study involved 149 respondents drawn from the county. Data was collected through questionnaires. The data gathered was analyzed using co relational, multiple regression and descriptive statistics. Tables were computed to draw some inferences related to the variables investigated.

The results show that whenever the independent variables in a combined model which included in this case availability of internet services, ease of using iTax and the technical skills required have value of significance as 149, adoption of iTax will thus be rated as 3.65. This shows further that any increase in a unit of internet availability is likely to translate to 3.48 increases in the adoption of iTax as a tax filing system. In addition, a unit increase in the way in which users will perceive that iTax is easy to use can lead to a 3.58 increase in the adoption of online tax filing system. Lastly, these results reveal that an increase in a unit of technical skills can lead to an increase in the adoption of iTax by a value of 3.36.

The study therefore concludes that these findings point out that availability of technical skills is the least influential dynamic \( (\beta = 3.36; p = 149) \) while the ease of use is the most influential factor \( (\beta = 3.58; p = 149) \) which determines the taxpayers’ adaptation of iTax in Bomet County. The study further established that despite availability of internet there is still need for more training on use online iTax system.

The study acknowledges that to some extent the Kenya Revenue Authority has put in place good system for filling returns there is still need for more infrastructures for ease accessibility of internet services. The system should have observable outputs and its adoption should be drive through the user social interaction and organizational support. However a lot more can be done on training of taxpayers on the use of iTax by the Kenya Revenue authority in order to increase the awareness of iTax system. The study also recommends that Kenya Revenue Authority to should modify the iTax system so that they will enable untrained SMEs to use.

The study found that accessibility of internet was the main influence of adoption iTax. The study therefore recommends that further studies be carried out on the factors the lead to adoption of iTax in other sectors.

The study was also carried out in the context of Small and medium tax payers and also further research on large tax payers operating in Kenya.

### REFERENCES


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Econometric Measurement of Earning Differentials for the Workforce Working in Technical Educational Institutes of Lahore

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August 2017

Abstract: Despite of the large number of studies related to earning differentials there are very few studies that attempts to estimate earning differentials for the workforce working in technical education institutions especially in Case of Lahore. Therefore, this study is designed to examine the factors that affect the earnings of the worker working in the technical educational institutions of Lahore District of Punjab province of Pakistan. Mincerian Human Capital Earning Function Approach was used to estimate the earning differentials of the workforce working in technical educational institutes of Lahore. Primary data was collected for the sample of 1168 respondents in 2015 directly from the field in order to conduct the current study. Empirical analysis indicates that education, experience, training acquired, computer usage, institution from where respondent had completed their secondary school certificate (SSC), gender, family status and family background were found to be contributing factors towards the earnings of the workforce of various categories of the technical educational institutions in Lahore. Results also recommend that implementation of such policies and development programs that reduces or minimizes the earning differentials among the staff which arise on the basis of occupation (teaching and non-teaching).

Introduction

According to the Classical Economists, wage is the price of labor that is usually determined by the demand and supply of labor. When labor offers their services in the market, the price they charge is influenced by several factors on the demand side. It depends on the demand and supply of labor. In addition, wages are shaped by the worker’s skillset, employers need, as well as the location where job is being offered. Classical Economists call this a theory of wages determination. These wages paid to the worker varies greatly called wage differentials. Earning differential is basically a term used in the labor market to examine the relationship between wage rate and other undesirable attributes of the particular job. Earning differentials has become the one of the important subject of interest of researchers in recent years across the world as it has been realized that earning differentials not only challenges social justice goals but can also have adverse economic consequences.

For every country, development of the labor force sector has been the top priority. But the policies that had been developed so far, earing differentials and unemployment remained the major issues in the economy of many developing countries like Pakistan. According to the
Global Wage Report 2015-16, inequality trend in the labor market is mainly due the change in wages distribution and paid employments in many countries. Technical education plays an important role in building human capital and hence in the development of a country. It raises the efficiency and the productivity of the individual which eventually produce a skilled manpower and ultimately can lead economy towards a sustainable economic development. There is a great variation in earnings paid to the workers. These differentials are majorly due to the difference in the worker effort in performing the job and ability to work. Earning differentials also exists across occupation, because of demand and supply of workers for a particular job.

At the time of independence in 1947, Pakistan had a very weak Training and Vocational Education (TVE) base; this was supported by Akram and Khan (2007), Munir (2002) and Shah (2003). During 1950-2002 hundreds of vocational education (middle, secondary and higher level), polytechnic institutes, colleges and universities had been established both in private and public sector. This fact is worry some that still in Pakistan, technical education is considered as post-secondary courses and practical training intended to produce technicians, who works as supervisory staff (middle level), however vocational education considered as lower level training and education for making skilled and semi-skilled workers in different professions.

Federal Ministry of education is responsible under education department for making education policy. In this regard, many different trainings policies in the country were discussed. Under the Education Policy 1972-80 at middle level in school, vocational and training workshops were opened where students were taught vocational training, child care, weaving, black-smithy, electricity, book-binding, food preservation, wood work, home management and agriculture in accordance to the local requirement. In terms of promotion, 1981-1991 was the worst time period of vocational training in Pakistan. From 1981-1991 nothing special was added to the existing vocational and training educational schools and colleges rather to avoid the student movement in contradiction of dictatorial government many polytechnic institution and colleges were closed. Vocational and technical training need was felt in Education Policy of 1992-2002 after analyzing it thoroughly. But semi-literate dropouts training remained a major problem.

The Education Policy 1992-2002 led to the establishment of a network one each in all four provinces of Pakistan ‘the teacher training institutes’ which link them to the national teacher training college at federal level. A new National Education Policy 1998-2010 was formed, however Education Policy 1992-2002 was still under implementation just to satisfy the market oriented education system. According to National Educational Policy 1998-2010 sustainable socioeconomic development is not possible only with the capital investment unless there is proper supply of trained scientific and technical human resource. According to this policy, for general education there had been larger increase in the facilities in the country but for promotions of TVE facilities and opportunities provided were not enough. Technical Education Project 1996-2003 was another noticeable scheme initiated by the Federal Ministry of education with support of Asian Development Bank (Javied & Haider, 2009).

Pakistan is the sixth largest country with the population of 20 billion in 2017 as per current census. Pakistan’s population is expected to be double in 2045 if it continues to grow at the rate of one point eight percent (Nasir and Nazli, 2000). This indicates the need of generating the ways
to employ the coming flood of people. Measurement of the earning differentials will help to recommend the suitable polices in this regard.

Determinants of individuals earning differentials have been one of the topics that took too much attention in economic literature in the early studies starting form 1960’s. All these early studies used Human Capital Approach in which the basic determinant of personal earnings was the investment to human capital. But researchers such as Behrman and Taubman (1976) and Morgenstern (1973) added some variables like father’s education, gender, occupation and employment status to extend to basic human capital model as the models developed in early 60’s were criticized for not taking an account of socio-economic factors. After that some other researcher like Psacharopoulos (1977a); Kasnakoğlu (1978); Tachibanaki (1980) and Varlıer (1982) went further and developed simultaneous equation systems to explore the link between education, occupation and earnings. There are a lot of studies that had been done in order to estimate the earning differentials in both developed and developing countries around the world, including Pakistan.

In Pakistan, available literature is lacking in finding out the earning differentials of the workforce of technical educational institutes especially working in Lahore. So this study intends to measure the earning differentials of the workers working in technical educational institutes of Lahore by developing family background and family status indices. So far there has been hardly any study on measurement of earning differentials using indices of Family Background and Family Status as determinants of individual’s earnings.

As there are some delimitations that lies with every research since it is very difficult to study all the aspects of a certain problem. So this research is delimited to only one sector of education i.e. technical educational institutions because it has been observed that colleges and universities in Pakistan are used to place an emphasis on certification and theory problems. But now this perception is changing and focus of all the technical institutes is more on skill and training acquisition. These institutions are providing sufficient amount of supply of efficient and effective instructor, training material and enhanced learning environment.

**Review of Empirical Literature**

**Technical Education:** Technical education has to be extremely important to the other sectors of the society due to its nature. For socio-economic development there is a need of technical and skilled workforce (Inamullah, Naseeruddin, Hussain & Shah; 2009). Inamullah et. al. (2009) concluded in their study with reference to Pakistan that teachers of technical educational institutes were only expert of academic teaching but they are not good at modern teaching techniques. They also added that no budget is allocated for the training of teachers of technical educational institutions of NWFP province of Pakistan. This was supported by Shah (2004) in his study of problems and prospects of technical education in Pakistan and also Shah, Rahman, Ajmal, and Hamidullah (2011) in their study of situation analysis of technical education and vocational training of Pakistan.

Many international studies such as Retallick and Miller (2010), Reynaldo and Martinez (2007), Yocke, Maldonado, Saddler (2007), also supported technical education as an important indicator.
for nation’s development. They also concluded that there are very few Latino who get enrolled in the post-secondary technical education program particularly in the occupations that are considered to be high skill and high earnings. The authors believe that the quality of the future Labor market of United States highly depends on the education and job skill on this group.

**Education and Experience:** Education is one of the main sources of human capital accumulation which have positive and direct effect on individual’s life time earnings. Chew (1990) found education the most important factor that effect earnings in software and marketing occupation of supply sector as well as software occupation of IT user sector.

Alam (2008) tried to present the picture of technical and vocational education for Bangladesh. This study also suggested that Bangladesh needs to propose in-service training programs for different subjects at different level which can help the employees to manage the changes in technical and vocational education. The study concluded that a well-planned technical and vocational education can help Bangladesh to raise their economic growth.

Faridi, Hussain and Bashir (2010) presented a study of public sector universities of Pakistan showing education impact on student’s earnings. Data was collected from the two upper and lower Punjab public sector universities. The work had been divided into two parts. In the first part, statistical and descriptive analysis and in the second part econometric analysis had been discussed. Results for the first half showed that there was a positive relation between higher education and monthly earnings. For second part OLS had been used to analyze educational level impact on earnings of students. Results showed that there was a significant and positive contribution of experience and years of schooling completed on student’s monthly earnings. They concluded that earnings of the students increase with the increase in level of education.

On the other hand Patrinos (1995) said that women get more benefits than men because of occupational experience.

**Training and Computer use:** Training is another important indicator of earnings. Booth (1993) observed a positive impact of training on their productivity and wages for the British graduates. According to his conclusion training have considerably more effect of male earnings than the female, as the male acquire more training than the female workers. Furthermore Torp (1994) conducted a study in Norway and evaluated that training reduces the unemployment by increase in workers productivity. Javied and Hyder (2009) investigated the role of training in wage determination by using OLS technique. For this purpose cross-sectional data from Pakistan Labor Force Survey 2005-06 had been used. Their results showed that training have insignificant impact on earnings because of the poor quality of training.

Many studies at international level such as Black and Lynch (2001), Dearden, Reed and Reenen (2006), Dieckhoff (2007), Gabriella (2005), Sanchez, Barba and Valle (2003) and studies at national level such as Ghafoor, Khan and Aslam (2011), Ameeq and Hanif (2013), Kemal (2005), Khilji, Kakar and Subhan (2012), Mustafa, Abbas and Saeed (2005), Nawaz, Hassan, Hassan, Shaukat and Asadullah (2014), Zained and Hyder (2009) found positive relationship between training acquired and the earnings of the individual. On the other hand, Bartel (1994) did not find any impact of formal training on the workers productivity in terms of earnings.
Computer usage: Computer usage is considered to be an important indicator of individual’s earnings as well as institutional productivity. Few studies such as Afzal (2011; 2014), Borghans and Ter Weel (2004), Krueger (1993), Lehr and Lichtenberg (1999) found positive effect of computer use on earnings and few like Kemerer and Sosa (1991) found positive but insignificant impact of computer use on individual’s earnings. Krueger (1993) found that because of the computer use, there was 10 to 18 percent increase in the earnings of the individual. Green (1998) concluded that computer use is highly valued at the work place. He also found that individuals with the ‘moderate level of complexity’ earn 13 percent more than the individuals who don’t use computer at all.

Family Status and Family Background: The family status found to be another contributing factor that had positive impact on individual’s earnings (Afzal, 2011; 2014). Shah (1986) concludes that family’s socio-economic status has negatively associated with the women labour force participation in Pakistan.

Another factor that can affect the earnings of the individual is family background. Many studies observed the positive relationship between family background and individuals earnings. Patrinos (1995) examined a positive and significant impact of family background on the earnings in different countries. Furthermore, Altonji and Dunn (1995) said that family background can be measured by the parent’s education. The author concluded that individual does with more educated parents earn more as compared to the individual’s with less educated parents.

Marital status and gender discrimination: Marital status is considered as an important independent variable that affects the earnings of and individual. Becker (1981; 1985); Green (2003), Greenhalgh (1980) and Kenny (1983) claimed that married individuals earned more than the unmarried individuals as they are more productive. Becker (1981); Keely (1977) and Nakosteen and Zimmer (1982) also claimed that married people earn more because of the characteristics like motivation and punctuality which are greatly value by the employer. According to Boheim et al. (2007) men received a marriage premium, however it is opposite in case of married women. Married women received fewer earnings than the unmarried women. Like many other countries, studies related to Pakistan also found out that marital status have positive and significant impact on earnings (Afzal, 2014; Javied & Hyder, 2009 and Yasin et al., 2010).

Gender discrimination is another factor that has significant impact on earnings. Gastwirth (1975) tried to study how industries can be ranked and to observe the trend over time. For this purpose USA government data had been used. It had been found that there were very few areas where women dominate the market. For the continuous work as compared to men, women don’t receive same economic returns which proved discrimination exists. This was supported by a study on gender earning differentials conducted by Patrinos (1995) for the workforce in engineering profession. In Greece large portion of women population manages make up to engineering workforce. The evidence showed that women earn less than men because of the discrimination in the labor market. To analyze gender earning differentials in occupation of engineering, survey of 1987 of employed engineers had been used. Results showed that difference in earnings was because of discrimination, not because of productivity, education and experience.
Awan and Hussian (2007) also examined that male workers were receiving high income as compared to the female workers. Another study by Chew (1990) attempted to analyze the gender earning differentials in Singapore for the workforce of Information Technology (IT) occupation. The author examined gender earning differentials for two differentials IT profession of IT sector. One was software and marketing profession for both supply and user sector. Study revealed that discrimination was not always a reason behind earning differentials but there were other factors too like experience, education, age etc.

Nasir (2000) in his research tried to examine the earning differentials among private and public sectors of Pakistan. For the purpose of comparison, the private sector further divided into informal and formal sectors as it develops extended form for Human Capital Model to analyze major determinants of income. The author found that individuals working in public sector earn more in comparison to the individuals working in formal as well as informal private sectors. These higher earnings were not because of the wage structure of public sector but their own superior personal human capital endowment.

All of the studies mentioned-above were mostly outdated and constrained by data, number of variables included and estimation methods. The present study differs from previous study in terms of the nature of the data i.e. primary, sample size (1168 observations), geographical area of the study (Lahore) and the sector (Technical educational institutes). Furthermore there is hardly any study found that measures the earning differentials by constructing different indexes for family background and family status as independent variables.

**Data Source and Methodology**

**Target Population:** Keeping in mind the objective of the study, the targeted population of this study was the workforce working in technical educational institutes of Lahore. In order to avoid the confusion that result because of the variation among the different sector this study focuses only on technical educational institutions and specifically those institutions which were affiliated with Punjab Technical Board of Pakistan.

**Sampling:** In the current study, the sample is taken from the individuals working in technical educational institutes of Lahore and especially those institutes were selected which were affiliated with the Punjab Technical Board of Pakistan. The reason for selecting the sample instead of population was money, time constraint and other resource constraints. Getting data from the whole population of individuals working in technical educational institutions and also analyzing and interpreting the huge amount of data was difficult within the limited financial resources and the time constraints associated with the research.

**Questionnaire Design:** Questionnaire has been used as research instrument for the data collection. A questionnaire had two main types of responses. First, open-ended questions and second was close-ended questions. In open-ended questions, respondents could answer the questions in their own words. However in close-ended questions, there were dichotomous, multiple-choice and scaled based questions. The questionnaire was designed keeping in mind the objectives of the study. As a survey instrument, a questionnaire was designed for the study to investigate the individual’s earnings and the major factors that determines the earnings for both
teaching and non-teaching workforce of each of private and public technical educational institutions. The structured questionnaire consists of three main sections as given below:

I. Personal Information
II. Qualifications, Experience, Computer Skills and Trainings Acquired
III. Respondent’s Household Information

First section contained the personal information of the respondent which includes respondents name, organization name, town or area in which organization falls, nature of job and monthly income. Second sections included the information about the education qualifications, job category (Teaching or Non-teaching), type of the institution (private or public), total working experience starting from the first job to last, use of computer at work and foreign language proficiency. Third part comprised the respondent’s household information such as gender of the household, income of the household, respondents gender, language use at home for communication, parents education and occupation, marital status of respondent, total years of spouse education received, employment sector of respondent’s spouse, monthly income of spouse, residence (Owned, rented, Govt. accommodation or other), size of the house, ownership of agriculture land and annual income for agriculture land, can ownership by respondent, car ownership by the family member of respondent, total number of mobile phones, respondents SSC from private or public sector school.

Section I: Personal information

This section included the basic information about the worker working in technical educational institutes of Lahore. For example the name of respondent (optional), name of the institute, town or location of the institute. And the variables used in this section were gender, nature of job and monthly income of the respondent from all sources like income from the main job, other job and also income from the occasional jobs. Income from the occasional jobs is the one you get from entrepreneurship, farming a family agriculture land or from a private business. Gender is an important factor that can affect the individual’s earnings. Chew (1990) found that gender preference is the variable that found to be effective in IT managerial supply sector. Supporting Chew (1990), Afzal (2011; 2014) also said that gender is an important factor that contributes in individual’s life time earnings.

Section II: Qualifications, Experience, Computer Skills and Trainings Acquired

The second section investigated the professional qualifications or skill set of the respondent based on his education (in terms of years of education completed), SSC (secondary school certificate), the category of the respondent in the institutes (teaching or non-teaching), type of the institution they are working in, their total work experience staring from the first job to the present one, use of computer at work, respondents foreign language proficiency and formal training. Professional qualifications is very important in determination of individuals life time earing. Education and experience are direct link to the individual’s earnings. Individuals with the higher education and experience earn more as compared to the other people with low education and experience (Faridi et al, 2010). Furthermore training also has an impact on individual’s earnings. Training has positive but insignificant impact on earnings because of the quality of
trainings (Javied & Hyder, 2009). So the study is also expecting a positive link between training and earnings for the workforce working in technical educational institutes.

Section III: Respondent’s Household Information

This section tried to find the importance of respondent’s family background and family status in determining their earnings. This section represents the different indicators of family background and family status indicators with reference to Pakistan which were further used in the development of indexes of family background and family status. Indicators of family background include parent’s education, parent’s occupation and the language that has been used at home for the sake of communication. Family status indicator included income of the head of the household, employment sector and salary of spouse, residence of respondent, area and the size of the house, income from the agriculture land, ownership of car and numbers of cars own by other family members and number of mobile phones in a household. Azal (2011, 2014) used family background and family status as an indicator in order to determine individual earnings in Pakistan. It had been found that family background and status have a positive and significant impact on individual earnings. So current study is also expecting and positive impact of both Family Background and Family Status indices on the earnings of technical educational institute’s workforce.

Scale of Instrument: In social science research, question on a Likert scale are widely used. Maximum questions used in the questionnaire were kept close ended using nominal and ordinal scale except from the occupation of the parents. For some questions Likert scale of different points had been used. While open-ended questions like occupation of respondents mother and father were measured by the ISCO-8 (International Standard Classification of Occupation) scores of major groups of occupation. ISCO-8 divide occupations in 10 major groups give below:

<table>
<thead>
<tr>
<th>Codes</th>
<th>Occupations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Manager</td>
</tr>
<tr>
<td>2</td>
<td>Professionals</td>
</tr>
<tr>
<td>3</td>
<td>Technicians and Associate Professionals</td>
</tr>
<tr>
<td>4</td>
<td>Clerical Support Workers</td>
</tr>
<tr>
<td>5</td>
<td>Services and Sales Worker</td>
</tr>
<tr>
<td>6</td>
<td>Skilled Agricultural, Forestry and Fishery Workers</td>
</tr>
<tr>
<td>7</td>
<td>Craft and Related Trades Workers</td>
</tr>
<tr>
<td>8</td>
<td>Plant and Machine Operators and Assembler</td>
</tr>
<tr>
<td>9</td>
<td>Elementary Occupations</td>
</tr>
<tr>
<td>10</td>
<td>Armed Force Occupation</td>
</tr>
</tbody>
</table>

Sampling Dynamics: The sample size was equally distributed among the nine towns of Lahore and Lahore Cantt targeting technical institutions affiliated with Punjab Technical Board. Keeping in view the objective of the study, both private and public institutes were targeted for the data collection. Furthermore for the second objective, data was collected from categories of staff teaching and non-teaching both from targeted technical educational institution. There were 74
technical institutes affiliated with the Punjab Technical Board. Fifteen hundred questionnaires were distributed in technical institutes and colleges which were affiliated with Punjab Technical Board of Pakistan.

Hence, there were two constraints that were faced at the time of data collection that was time and non-availability of the respondents. So after studying literature it had been observed that to achieve the objectives of the study from the whole list of institutes affiliated with Punjab Technical Board can be focused more on the institutes that are providing technical education than the other institutes.

**Pre-Testing and Reliability test:** To check the reliability and validity of the questionnaire, a pre-test was conducted. For pre-testing, 60 questionnaires were distributed equally in both public and private institutes of technical education. These 60 questionnaires were not including in the actual sample size. Thirty questionnaires had been filled from each institute (public and private institutes). Questionnaires got filled from both teaching and non-teaching staff of those institutes as researcher wanted the equal participation of both categories. Thus, 15 questionnaires had been filled up from the teaching and 15 from the non-teaching staff of each public and private educational institute. During this, respondents were encouraged to ask questions and comment on any question, if they have problem in understanding the question or the statement was unclear. Responses showed few weak points in the questionnaire so some modifications were made before finalizing the questionnaire.

Cronbach’s Alpha test established by Lee Cronbach’s in 1951 was used to test the reliability of the questionnaire. Results of Cronbach’s alpha test are given below:

<table>
<thead>
<tr>
<th>Cronbach’s Alpha test</th>
<th>No of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.756</td>
<td>54</td>
</tr>
</tbody>
</table>

Since value of Cronbach’s Alpha test was 0.756 which is more than acceptable for the reliability. Which means now data can be collected from the respondents.

**Data Collection Source:** The source of data collection that had been used in the study is primary source. Data has been collected by the researcher’s themselves from the technical educational institutes of Lahore. Since, Primary data is considered more accurate, reliable and authentic then secondary data since it has not been published previously, thus it has not been altered or changed by people. Researchers used primary data sources to get first-hand information for the variables of interest to achieve the objectives of study.

**Consent:** Permission was taken from the educational institutions, where the study was being performed before collecting or conducting the survey. Permission letter had been submitted to the Head/Principal of the educational institutes with the brief description of the study and ensuring the administration and the respondents that their response to the questionnaire will be kept strictly confidential and will not be disclosed or used for purpose other than the research.
Data collection: After getting permission, data was collected from workforce of technical educational institution affiliated with the Punjab technical board. Data was collected through various means such as direct visits to the institutions, where questionnaires were randomly distributed among the teaching and non-teaching staff, interviews were conducted and also via emails from the technical educational institutes of Lahore.

Response Rate of the Study: For attaining the objectives of the study a sample of 1168 observations has been collected. Total 1500 questionnaires were distributed in the technical educational institutes because 253 questionnaires were not returned by the respondents. So in order to complete the sample size extra questionnaires got printed. But after data cleaning only 1168 questionnaire were left that could be used for the final estimation. As around 79 questionnaires were not seriously filled or usable. For the distribution and collection of data from relevant respondents simple random sampling technique have been used in the sample institutions.

Table 3

<table>
<thead>
<tr>
<th>Details of respondents of technical institutions by sectors and categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents from Public Sector Institutes</td>
</tr>
<tr>
<td>Respondents from Private Sector Institutes</td>
</tr>
<tr>
<td>Total Respondents</td>
</tr>
</tbody>
</table>

Data Analysis: As a first step towards the analysis data collected through questionnaire were organized and sorted. And for all analysis Statistical Package for Social Sciences (SPSS) version 21.00 was used.

Diagnostic Method: After sorting data on earning differentials for the workforce working in technical educational institutes of Lahore, analytical techniques such as frequencies, averages, dispersion and percentages were used as the study is quantitative in nature.

Descriptive Analysis: In order to interpret data, descriptive statistics were applied. Data were represented or described by the frequencies, averages and percentages. According to Fisher and Marshall (2009) that’s the graphical techniques and the numerical procedures are used in order to describe the characteristics of the sample data set. In current study, descriptive analysis was used to explain the characteristics of the data set e.g. demographics, professional qualification and the household information.

Methodology:

Regression Model: In order to estimate the earning differentials for the workforce working in technical educational institutes the current study used Mincer Basic as well as Augmented
Human Capital Earning Function Approach as was used by studies by Afzal et. al. (2010), Afzal (2014), Daneshvary (1993), Fernandez (2009) and Siddiqui and et. al. (1998).

**Model Specification:** To identify and estimate the earning differentials for the workforce of technical educational institutions, the following models were considered:

**Mincer Basic Human Capital Earning Function:** According to Basic Human Capital Model, natural log of individuals earnings in a given time period was explained or determined by the education and experience squares (Mincer, 1974) as give below:

\[ \ln Y_i = \beta_0 + \beta_1 Edu_i + \beta_2 Exper_i + \beta_3 Exper_i^2 + \mu_i \]  
(*Basic Model*)

**Augmented Earning Function:** Augmented Earning Function was specified in the form of regression model as follow:

\[ \ln Y_i = \beta_0 + \beta_1 Edu_i + \beta_2 Exper_i + \beta_3 Exper_i^2 + \sum_{i=1}^{k} \beta_i X_i + \mu_i \]  
(*Model 1*)

Another form of Model 1, when education is being measured by ‘years of schooling completed’ is given below:

\[ \ln Y_i = \beta_0 + \beta_1 Edu_i + \beta_2 Exper_i + \beta_3 Exper_i^2 + \beta_4 Comp_i + \beta_5 Train_i + \beta_6 SSC_i + \beta_7 Gend_i + \beta_8 Lang_i + \beta_9 FBI_i + \beta_{10} FSI_i + \mu_i \]  
(*Model 2*)

Where as,

\[ \ln Y_i = \] Natural log of net per month earnings of the workforce of technical educational institutes of Lahore in fiscal year 2016. Net monthly earnings include net salary from the main job plus from other and occasional jobs. Income from occasional job includes income from research projects or script marking income from entrepreneurship etc.

\[ Edu_i = \] Education of the \(i^{th}\) respondent. \(Edu_i\) is measured in term of ‘years of schooling completed’. It is the main predictor variable in an earning function. \(\beta_1\) is the estimated coefficient associated with \(Edu_i\) which measures the marginal rate of percentage change due to an additional year of schooling which is expected to be positive in the current study, which also measures private financial returns to education of \(i^{th}\) respondent.

\[ Exper_i = \] Total number of years of work experience (from the first job till the current job) of the \(i^{th}\) respondent. \(\beta_2\) is the estimated coefficient associated with \(Exper_i\) which measures the marginal rate of percentage change due to an additional year of experience. In the present study it is expected to be positive in the current study.
\[ \text{Exp}r \text{t}^2_i = \text{Squares of total number of years of work experience of the } i^{th} \text{ respondent.} \]

A positive and negative value of the coefficients of variables \( \text{Exp}r \text{t}^2_i \) and \( \text{Exp}r \text{t}^2_i \), respectively shows the concavity of experience-earning profile. By concavity of experience-earning profile it mean an additional year of experience will lead to high earnings but at decreasing rate.

\[ \text{Comp}_i = \text{Computer literacy, measured by the use of computer/internet at work (it is a dichotomous variable, } '1' \text{ for using computer and internet at work and } '0' \text{ otherwise) by the } i^{th} \text{ respondent.} \]

\[ \text{Train}_i = \text{Foreign/local training acquired which was helpful for the job, (it is a dichotomous variable, } '1' \text{ for Yes, if the respondent has received training and } '0' \text{ for No, if the respondent has not receive any local/foreign training) by the } i^{th} \text{ respondent. In case of many developing countries including Pakistan it had been found that training have a direct or positive impact on earnings (Afzal, 2014; Gaag & Vijverberg, 1989; Jimenez & Kugler, 1987; Naisr, 1990).} \]

\[ \text{SSCsector}_i = \text{Sector of institution from where } i^{th} \text{ respondent has completed Secondary School Certificate ('1' for SSC from government institution and '0' for SSC from private institution).} \]

\[ \text{Gend}_i = \text{Gender of the } i^{th} \text{ respondent ('1' for the male respondent and '0' for the female respondent). The impact of gender on earnings subjected to the empirical results/outcome.} \]

\[ \text{Flangu}_i = \text{Foreign Language Proficiency of the } i^{th} \text{ respondent ('1' for Yes and '0' for No). The impact of Foreign Language proficiency on earnings is expected to be positive in the current study.} \]

\[ \text{FBI}_i = \text{Family Background Index was developed by parent’s education and parent’s occupation of the } i^{th} \text{ respondent and the language use at home for communication. This study differs from the other studies because of the use of ‘family background index’ rather than simply measuring it by father’s education in terms of years of schooling completed of the } i^{th} \text{ respondent. Many researcher have used fathers education as a measure of family background like Afzal (2011; 2014) for Pakistan, Armitage and Sabot (1987) for Kenya and Tanzania, Neuman (1991) for Israel, Liu et al. (200) for Greece, San-Segundo and Valiente (2003) for Spain. Research conducted by Afzal (2011; 2014) found positive relationship between family background and earnings in case of workforce working educational institutions of general nature. So, this study also expected the direct link between earnings and family background.} \]
\( FSI_i \) = Family Status Index was constructed by different indicators. In Pakistan, FS (Family Status) of an individual is known by his/her residence, area and the size of the house, income from the agriculture land, income of the head of the household, spouse education, employment sector of spouse, income of spouse, ownership of car, number of cars owned by the other family members, number of mobile phones in a household of the \( i^{th} \) respondent. Another factor that makes this study different from the other studies because of the use of another index i.e. ‘Family Status Index’ rather than simply measuring it by ownership of car by the \( i^{th} \) respondent. Afzal (2011, 2014) used car ownership as a measure of family status in case of Pakistan and found the positive link between family status and the individual’s earnings. The current study is also expecting the direct relationship among family status and earnings.

\( \mu_i \) = Random Error Term

**Method for Constructing Family Background and Family Status indices:** Over the year’s numbers of indices have been constructed including living conditions index to measure inequalities in health, housing etc. by Social and Cultural Planning Office of Netherlands (Boelhouwer & Stoop, 1999), Duncan’s index in order to classify occupation by income and education (Oakes & Rossi, 2003) and many more indexes. But while constructing indexes, the most important problem faced by the researcher is finding a suitable aggregation strategy in order to combine the multidimensional indicators into a composite index.

For current study PCA found to be a most suited method to construct a Family Background and Family Status index.

**Principal Component Analysis (PCA):** PCA was given by Pearson (1901). PCA is a useful technique for converting or transforming large number of variables into a smaller and more consistent/logical uncorrelated set of factors.

PCA is an approximation to PFA (Principal Factor Analysis) if the components are rotated. Difference between both techniques is that PCA assume that in a variable all variability should be used in the analysis, however in PFA variability that is common with the other variables are used. In most of the cases results of both techniques are more or less the same. Though PCA is more suitable for the data reduction and PFA is suitable for detecting structure.

PCA was first used develop a single index by combining socio-economic indicators (Boelhouwer & Stoop, 1999). Since late 1990s many researcher such as Antony and Rao (2007), Fukuda, Nakamura and Takano, (2007), Rygel, O’Sullivan and Yarnal (2006); Tata and Schultz (1988); Sekhar, Indrayan, and Gupta (1991); Zagorski (1985) have used PCA to compute indexes. The method of constructing family status and family background indexes built from the weights generated using PCA have potential to explain earning differentials.

**Indicators Selection for an Index:** Various indicators were included in an index development keeping in mind the factors and in the light of literature that directly or indirectly represents the
Family Background and Family Status. In general, the indicators that are repeatedly discussed as family background were parent’s education, language used at home for communication purpose and parent’s occupation, income of the household. According to Duncan and Magnuson (2003), that parental educational attainment, home-learning environment and parent teaching-style have a strong correlation with the children achievement. Another indicator used as an indicator or family background is parent’s occupation. Generally, it has been assumed that father is the main figure who is responsible for the socio-economic wellbeing of the family (Afzal, 2011; 2014). The mother’s occupation is taken as a substitute only when father’s occupation is not available. But this approach has become questionable. As over the last decades, employment condition of the household has been changed drastically. Now even mothers contribute in the family income (Entwisle & Astone, 1994).

Indicators generally used as the representative of family status in Pakistan are the number of cars owned by the individual and their family members, residence, size of the house, spouse education, spouse income, income from other sources like from agriculture land and total number of phones and mobile phone in a household. In case of Pakistan all these are considered as an important representative indicators of family status. In many developing countries, especially in countries like Pakistan having car is one of the important indicator of family status. Ownership of a house along with the ownership of car(s) is consider as a high family status in Pakistan. (Afzal, 2011; 2014). However, few of these indicators were dropped from the analysis because of missing values.

**Testing the Appropriateness of a Principal Component Analysis:**

The correlation between the indicators was checked before preforming the PCA. Kaiser-Meyer-Olkin (KMO) has been used in the present study to check the sample adequacy.

Another test which is used to check the strength among the indicators is Bartlett’s Test of Sphericity. Maximum KMO can be 1.0. A value of 0.9 degree of common is considered as marvelous, 0.80 as meritorious, 0.7 as middling, 0.6 as mediocre, 0.5 miserable and any value below 0.5 is unacceptable. In current study KMO value for the family status index was 0.63 (degree of common variance is mediocre) and Bartlett's statistics is significant, as for family background index KMO value was 0.542 and Bartlett's statistics is significant which shows degree of common variance is miserable but data still can be used to preform PCA. Table 4 shows the results of KMO for both family background and family status index. These diagnostic procedure shows that PCA is appropriate for the data.

<table>
<thead>
<tr>
<th>Table 4</th>
<th>KMO and Bartlett’s Test of Sphericity</th>
</tr>
</thead>
<tbody>
<tr>
<td>KMO Measure of sample adequacy</td>
<td>Bartlett's Test of Sphericity</td>
</tr>
<tr>
<td></td>
<td>Chi-Square</td>
</tr>
<tr>
<td>Family Background</td>
<td>0.542</td>
</tr>
<tr>
<td>Family Status</td>
<td>0.63</td>
</tr>
</tbody>
</table>
Assessing Outliers, Normality and Linearity: There are number of issues that need to be discussed which constructing an index using factor analysis (Nardo, Saisana, Saltelli, & Tarantola, 2005). There are few assumptions that need to be considering while developing composite indices based on factor or Principal Component Analysis. But often these assumptions are neglected by the researcher.

Presence of outliers can affect results of the factor analysis and their interpretations, as with the most of the statistical technique. In the data set outliers are the higher and lower values then the other values that can affect the correlation and therefore distort the results of factor analysis. Outliers in the data set can be checked using various SPSS techniques such as histogram or normal Q-Q plot in which observed values for each score is plotted against expected value, box-plot, histogram and descriptive statistics. In current study outliers were detected using box-plot and removed before applying PCA.

Secondly, PCA can be sensitive to non-linear relationship between variables. As the correlation coefficient undervalue/underestimate the strength of the relationship. If the sample size is small then this problem can be critical. But in case of current study sample size is not the issue. Tabachnick and Fidell (2007) noted that in case of large sample size ‘skewness will not make a substantives difference’. Furthermore descriptive statistics, such as Skewness and Kurtosis are used to detect the type of distribution of the data. Skewness is used as a measure of symmetry and Kurtosis is used as a measure of peakedness.

Empirical Results and Interpretations:

To estimate the earning differentials, an econometric model was estimated by using Ordinary least square (OLS) are given below:

1. Entire workforce of technical educational institutions (full sample).
2. Entire workforce of private sector technical educational institutions.
3. Entire workforce of public sector technical educational institutions.
4. Teaching workforce of private sector technical educational institutions.
5. Non-Teaching workforce of private sector technical educational institutions.
6. Teaching workforce of public sector technical educational institutions.
7. Non-Teaching workforce of public sector technical educational institutions.

Table 5.2 and 5.3 shows the OLS estimated results of semi-logarithmic earning equation for the workforce working in technical educational institutes of Lahore, when education of the workforce is measure by ‘the years of schooling completed’.

Interpretation of PCA results

- **Family Background Index:** Family background index was developed using four indicators. As an input to PCA correlation matrix used to extract the factors as indicators were not standardized. Results of Family Background index are represented in Table 5.
- **The Kaiser Criterion:** The number of factors extracted can be decided by the Kasier Criterion and Scree Plot techniques available in SPSS 21. One of the most worldwide
used techniques in order to select the number of factors is ‘Kaiser’s Criterion’ or the Eigenvalue Rule. This criterion was first proposed by Kaiser in 1960. Under this rule we can retain only those factors with the eigenvalues greater than one. The factor is dropped unless it extract as much as the Equivalent variance of one original indicator/variable we drop that factor. For Family Background, data revealed two factors whose Eigenvalue was greater than one and is shown in Table.

### Table 5
Results of Family Background Index: Total Variance Explained

<table>
<thead>
<tr>
<th>Component</th>
<th>Eigenvalues</th>
<th>Total</th>
<th>Percentage of Variance</th>
<th>Cumulative Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.67</td>
<td>41.92</td>
<td>41.92</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1.02</td>
<td>25.63</td>
<td>67.56</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0.82</td>
<td>20.57</td>
<td>88.14</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0.47</td>
<td>11.85</td>
<td>100.00</td>
<td></td>
</tr>
</tbody>
</table>

**Scree Plot:** A graphical technique that had been used to select the number of factors was the scree plot which is also known as Catell’s Scree Plot. This plot shows the Eigenvalue of the each factor or component versus the number of factor/component. After examining the Scree Plot only two components or factors were extracted for the analysis. Figure 1 represents the Scree Plot of Eigenvalues of the components.

**Figure 1: Scree Plot of Eigenvalues of the components (FBI)**

Results accounted for PCA using Varimax Rotation are shown in Table 5.1. Two factors accounted 67.57 percent of the total variance in the data are derived. The first factor includes mother education, father education and mother occupation shows the higher positive loadings. The first factor accounted 41.92 percent of the total variation in the data. This factor is the better representation of the family background which means that better family background representation of an individual is associated with mother education, father education and the mother occupation.
The second factor includes only one indicator i.e. father occupation which accounted 25.63 percent of the total variation in the data. This study may interpret that Family Background can also be measured by the single indicator i.e. fathers occupation as single indicator.

### Table 5.1
Results of Family Background Index: Varimax Rotation Factor Matrix

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Factor 1</th>
<th>Factor 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother education</td>
<td>0.85</td>
<td></td>
</tr>
<tr>
<td>Father education</td>
<td>0.71</td>
<td></td>
</tr>
<tr>
<td>Mother occupation</td>
<td>0.65</td>
<td></td>
</tr>
<tr>
<td>Father occupation</td>
<td></td>
<td>0.92</td>
</tr>
<tr>
<td>Percentage of Variance (67.566%)</td>
<td>41.92%</td>
<td>25.63%</td>
</tr>
</tbody>
</table>

Note: Indicator with a positive loading shows a negative association to the component.

**Calculation of Family Background Index:** As a first step in computing a single index, using regression method factor score coefficients which are also called component scores were estimated. To compute the factor scores for a given component or a factor, standardized scores of each variable is multiplied to the corresponding factor loading and then summed up these products. To calculate the factor scores SPSS 21 software was used and factor scores were saved as a variable in subsequent calculations involving factor scores.

The two factors explained 67.56 percent of the total variation with first and second factor explaining 41.92 percent and 25.63 percent, respectively. So, the importance of the factors in measuring Family Background is not the same. Therefore, Non-Standardized Family Background Index (NSFBI) was developed by using proportion of all these percentages as weights of the factor score coefficient. The formula for finding NSFBI is given below:

\[
\text{NSFBI} = \left( \frac{41.929}{67.566} \right) \times \text{Factor 1 score} + \left( \frac{25.637}{67.566} \right) \times \text{Factor 2 score}
\]

The values of NSFBI could be positive or negative making an index difficult to interpret. Therefore Standardized Family Background Index (SFBI) was developed. The values of SFBI range from 0 to 100, The SFBI was developed by using following:

\[
\text{SFBI} = \frac{\text{NSFBI} - \text{Mini NSFBI}}{\text{Max NSFBI} - \text{Mini NSFBI}} \times 100
\]

\[
\text{SFBI} = \frac{\text{NSFBI} - (-1.36)}{5.54 - (-1.36)} \times 100
\]

\[
\text{SFBI} = \frac{\text{NSFBI} - (-1.36)}{6.9} \times 100
\]

• **Family Status Index:** Family Status index was developed using eight indicators. As indicators were not standardized, that is why correlation matrix was used to extract the factors, as an input to PCA. Same as used for family background index. Results of Family Status Index are shown in Table 5.2.

• **The Kaiser Criterion:** Under Kaiser Criterion as we can retain only those factors with the Eigenvalues greater than one. We drop that factor, if it does not extract as much as the equivalent variance of one original indicator/variable. For Family Status Index, data revealed three factors whose Eigenvalue was greater than one as shown in Table 5.2.

<table>
<thead>
<tr>
<th>Component</th>
<th>Eigenvalues</th>
<th>Total</th>
<th>Percentage of Variance</th>
<th>Cumulative Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.61</td>
<td>20.14</td>
<td>20.14</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>1.09</td>
<td>13.73</td>
<td>33.87</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1.01</td>
<td>12.73</td>
<td>46.6</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0.99</td>
<td>12.43</td>
<td>59.03</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0.87</td>
<td>10.95</td>
<td>69.99</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0.84</td>
<td>10.58</td>
<td>80.58</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0.82</td>
<td>10.25</td>
<td>90.84</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0.73</td>
<td>9.16</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

• **Scree Plot:** Scree plot represents the Eigenvalue of the each factor or component versus the number of factors/component. After examining the Scree Plot only three components or factors were extracted for the analysis.

**Figure 2: Scree Plot of Eigenvalues of the Components (FSI)**

Results accounted for PCA (Family Status Index) using Varimax Rotation are shown in Table 5.3. Three factors accounted 46.60 percent of the total variance in the data. The first factor includes net per month salary of spouse in Rs/-, size of the house and number of cars owned by other family members shows the higher positive loadings while ownership of a car by respondent shows negative loading. Orthogonal rotation factor loading range from minus one to plus one as they are the correlation coefficients of each variable with the factor. By negative loading it means that result need to be interpreted in the opposite direction from the way it’s stated. The
first factor accounted 20.14 percentage of the total variation in the data. This factor is the better representation of the family status which means that better Family Status representation of an individual is associated with the net per month salary of spouse in Rs/-, size of the house and number of cars owned by other family members and ownership of a car by respondent.

The second factor, it accounted 13.73 percentage of the total variation in the data. We may interpret that Family Status of an individual can also be measured by the spouse education, the income from the agriculture land and the total numbers of mobile phones in the household of respondents.

The third factor, it accounted 12.73 percentage of the total variation in the data.

| Table 5.3 |
| Results of Family Status Index: Varimax Rotation Factor Matrix |
|---|---|---|---|
| Indicators | Factor 1 | Factor 2 | Factor 3 |
| Per month spouse net salary in Rs/- | 0.57 | | |
| Respondent's spouse education | | 0.42 | -0.61 |
| Respondent's residence | | | 0.78 |
| Size of house | 0.69 | | |
| Agricultural income in Rs/- | | 0.59 | |
| Ownership of car by respondent | -0.63 | | |
| Ownership of car by other family members | | 0.44 | |
| Total No. of mobile phones in a household | | 0.589 | |
| Percentage of Variance (46.60%) | 20.14% | 13.73% | 12.73% |

Note: Indicator with a positive loading shows a negative association to the component.

**Family Status Index Calculation:** Same steps of Family Background Index were followed while computing Family Status Index. As a first step in computing a single index, component scores were estimated using regression method factor score coefficients. To compute the factor scores for a given component or a factor, standardized scores of each variable is multiplied to the corresponding factor loading and then summed up these products. Same procedure as followed in case of Family Background Index. To calculate the factor scores SPSS 21 software was used and factor scores were saved as a variable in subsequent calculations involving factor scores.

The three factors explained 46.6 percent of the total variation with first, second and third factor explaining 20.14 percent, 13.73 percent and 12.73 percent respectively. So, the importance of the factors in measuring Family Status is not the same. Thus, Non-Standardized Family Status Index (NSFSI) was developed by using proportion of all these percentages as weights of the factor score coefficient. The formula for finding NSFBI is given below:

\[
NSFSI = \frac{20.141}{46.600} \times (\text{Factor 1 score}) + \frac{13.730}{46.600} \times (\text{Factor 2 score}) + \frac{12.730}{46.600} \times (\text{Factor 3 score})
\]
The values of NSBI could be positive or negative making an index difficult to interpret. Therefore Standardized Family Status Index (SFSI) was developed. The values of SFSI range from 0 to 100, the SFSI was developed using following:

\[ \text{SFSI} = \frac{\text{NSFSI} - \text{Mini NSFSI}}{\text{Max NSFSI} - \text{Mini NSFSI}} \times 100 \]

\[ \text{SFSI} = \frac{\text{NSFSI} - (1.29)}{4.00 - (1.29)} \times 100 \]

\[ \text{SFSI} = \frac{\text{NSFSI} - (1.36)}{5.29} \times 100 \]

**Empirical Results and Their Analysis**

Table 5.4 presents OLS estimates of the ‘Basic Earnings Equation’ which is also known as ‘Basic Model’ as well as the ‘Augmented Earnings Equations’, also known as ‘Augmented Model’ for the workforce of entire private and entire public sector technical educational institution of Lahore. Table 5.5 provides the OLS estimates of the ‘Basic Model’ as well as the ‘Augmented Model’ (Semi-logarithmic earning equations) for the teaching and non-teaching workforce of private sector and also the teaching and non-teaching workforce of public sector technical educational institutions.

For the workforce working in **entire technical educational institution**, the results given in Table 5.4 show that, years of schooling completed, actual work experience, training acquired, foreign language proficiency and family status have a positive and significant impact on entire workforce earnings of technical educational institutions. Variable gender and secondary school certificate (SSC) are contributing negatively and insignificantly (Afzal, 2014).

For workforce working in **private sector technical educational institution** results given in Table 5.4 reveal that years of schooling completed, actual work experience, computer use, training acquired, gender, foreign language proficiency, family status and family background are the factors that positively and significantly contribute to the earnings of the workforce of private sector technical educational institutions, however SSC contributed as a negative factor.

For the workforce working in **public sector technical educational institution**, there results given in Table 5.4 reveal that the factors that positively and significantly contributed towards the earnings of the workforce are years of schooling completed, actual work experience, training acquired, gender, foreign language proficiency and family status. While family background contributes positively but insignificantly in the public workforce earnings, variable computer use and SSC are contributing as negative factors.
Table 5.5

OLS Regression Results of Basic and Augmented Models

Response variable: ln earnings, where the education of the workforce working in technical educational institutions is measured by ‘years of schooling completed’

<table>
<thead>
<tr>
<th>Workforce of technical educational institutions by sector</th>
<th>Workforce of entire technical educational institutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Sector</td>
<td>Public Sector</td>
</tr>
<tr>
<td><strong>Basic Model</strong></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>8.226</td>
</tr>
<tr>
<td>Edu (in years)</td>
<td>0.093</td>
</tr>
<tr>
<td>Experi (in years)</td>
<td>0.067</td>
</tr>
<tr>
<td>(Experi2/100)* (in years)</td>
<td>-0.001</td>
</tr>
<tr>
<td><strong>Augmented Model</strong></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>7.772</td>
</tr>
<tr>
<td>Edu (in years)</td>
<td>0.092</td>
</tr>
<tr>
<td>Experi (in years)</td>
<td>0.066</td>
</tr>
<tr>
<td>(Experi2/100)* (in years)</td>
<td>-0.001</td>
</tr>
<tr>
<td>Comp</td>
<td>0.056</td>
</tr>
<tr>
<td>Train (Yes=1)</td>
<td>0.184</td>
</tr>
<tr>
<td>SSC (Govt=1)</td>
<td>-0.086</td>
</tr>
<tr>
<td>Gender (Male=1)</td>
<td>0.103</td>
</tr>
<tr>
<td>Flang (Yes=1)</td>
<td>0.082</td>
</tr>
<tr>
<td>SFBI</td>
<td>0.004</td>
</tr>
<tr>
<td>SFSI</td>
<td>0.005</td>
</tr>
<tr>
<td>Obs</td>
<td>552</td>
</tr>
<tr>
<td>Adj R² (Basic model)</td>
<td>0.543</td>
</tr>
<tr>
<td>Adj R² (Augmented model)</td>
<td>0.694</td>
</tr>
<tr>
<td>F Statistic (Basic Model)</td>
<td>76.423</td>
</tr>
<tr>
<td>F Statistic (Augmented Model)</td>
<td>29.509</td>
</tr>
</tbody>
</table>

Values in parentheses are p-values.

*To get the coefficient value other than zero, experience squared term was divided by 100 as was done by Afzal (2014).
Table 5.4 revealed that factors that affect the earnings of the entire workforce positively and significantly are years of schooling completed, actual experience, computer use, training, foreign language proficiency, family background and family status.

The results given in the Table 5.4 shows that the coefficient of education variable contracts in case of Augmented Model confirming that returns to education does get effected by the other variables add in the model. Higher contraction was found in education and experience coefficients in case of public sector workforce which means that factor other than education and experience are more important in case of public sector workforce. Rate of returns to education were highest (10.5 percent and 10.2 percent in case Basic and Augmented Model, respectively) for public sector workforce as compared to the private sector workforce (9.3 percent and 9.2 percent in case of Basic and Augmented Model, respectively). These finding are consistent with the findings of Afzal (2014).

Returns to experience were highest in case of private sector workforce (6.6 percent) as compared to the public sector workforce (3.2 percent). Results given in Table 5.4 also indicates that impact of trainings on the earnings of the workforce of private sector technical institution were higher (18.4 percent) than that of the public sector (10.9 percent) educational institutions. Which mean people with the formal trainings earn 18.4 percent more in case of private sector technical educational institutes than that of the people with no formal trainings. And in case of public sector technical educational institutes, people with the formal trainings earn 10.9 percent more than the people with no formal trainings.

Respondent’s sector of secondary school certificate (SSC) contributed negatively and significantly only in case of private sector technical institutions as was found in Afzal (2011) in case of university respondents. This implies that SSC completed from the private educational institute matter only to the private sector respondent. Those employees who have passed secondary school certificate from the private institutes earn 8.6 percent more than those who passed SSC from the government institute. Such respondents might have good communication and presentations skill.

Male workforce earns more than their counter parts in both private and public sector of technical educational institutes as shown in Table 5.5. This earning gap found to be higher in private sector. Male respondents are found to earn 10.3 percent and 7.3 percent at private sector and public sector respectively. Females tend to pay less as compared to males although female are more educated (consistent with Hussain & Awan, 2007 and Afzal, 2011). This could be a result of male dominant society/male gender bias or better working environment for males.

Family Background is measured by developing an index based on four indicators i.e. mother education, father education, mother occupation and father occupation. The results given in Table 5.5 shows that family background found to be higher (4 percent) and significant in case of the workforce of private sector than the public sector (1 percent) technical educational institutions.

Family Status which is measured by an index based on eight indicators i.e. the number of cars owned by the individual as well as his family members, residence (whether they own the house, or live on rent or govt. accommodation etc.), size of the house, spouse education, spouse income,
income from other sources like from agriculture land and total number of mobile phone in a household. Family Status variables found to be positively and significantly contributed each of the workforces of private sector as well as in case of public sector as shown in Table 5.5.

Table 5.5
OLS Regression results of Basic and Augmented models

Response variable: ln earnings, where education of the workforce of Technical Educational Institutions by sector is measured by ‘years of schooling completed’

<table>
<thead>
<tr>
<th>Workforce of Technical Educational Institutions by sector</th>
<th>Public Sector</th>
<th>Private Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Teaching Workforce</td>
<td>Non-Teaching Workforce</td>
</tr>
<tr>
<td>Basic Model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>8.963</td>
<td>8.653</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Edu (in years)</td>
<td>0.089</td>
<td>0.090</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Experi (in years)</td>
<td>0.031</td>
<td>0.021</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.069)</td>
</tr>
<tr>
<td>(Experi2/100)* (in years)</td>
<td>-0.002</td>
<td>-0.002</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.492)</td>
</tr>
<tr>
<td>Augmented Model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>8.878</td>
<td>8.599</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Edu (in years)</td>
<td>0.080</td>
<td>0.089</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>Experi (in years)</td>
<td>0.032</td>
<td>0.020</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.104)</td>
</tr>
<tr>
<td>(Experi2/100)* (in years)</td>
<td>-0.003</td>
<td>-0.002</td>
</tr>
<tr>
<td></td>
<td>(0.153)</td>
<td>(0.507)</td>
</tr>
<tr>
<td>Comp</td>
<td>0.029</td>
<td>-0.038</td>
</tr>
<tr>
<td></td>
<td>(0.294)</td>
<td>(0.449)</td>
</tr>
<tr>
<td>Train (Yes=1)</td>
<td>-0.051</td>
<td>-0.093</td>
</tr>
<tr>
<td></td>
<td>(0.606)</td>
<td>(0.165)</td>
</tr>
<tr>
<td>SSC (Govt=1)</td>
<td>0.043</td>
<td>-0.034</td>
</tr>
<tr>
<td></td>
<td>(0.238)</td>
<td>(0.621)</td>
</tr>
<tr>
<td>Gender (Male=1)</td>
<td>0.139</td>
<td>0.084</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.152)</td>
</tr>
<tr>
<td>Flang (Yes=1)</td>
<td>0.005</td>
<td>0.076</td>
</tr>
<tr>
<td></td>
<td>(0.845)</td>
<td>(0.099)</td>
</tr>
<tr>
<td>SFBI</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(0.633)</td>
<td>(0.626)</td>
</tr>
<tr>
<td>SFSI</td>
<td>0.005</td>
<td>-0.005</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.998)</td>
</tr>
<tr>
<td>Obs</td>
<td>473</td>
<td>143</td>
</tr>
<tr>
<td>Adj R’ (Basic model)</td>
<td>0.69</td>
<td>0.72</td>
</tr>
<tr>
<td>Adj R’ (Augmented model)</td>
<td>0.74</td>
<td>0.73</td>
</tr>
<tr>
<td>F Statistic (Basic Model)</td>
<td>148.54</td>
<td>48.91</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>F Statistic (Augmented Model)</td>
<td>54.22</td>
<td>15.16</td>
</tr>
<tr>
<td></td>
<td>(0.000)</td>
<td>(0.000)</td>
</tr>
</tbody>
</table>

Values in parentheses are p-values.
*To get the coefficient value other than zero Experience squared term is divided by 100 as was done by Azal (2014).
Results presented in Table 5.5 revealed that the **rate of returns to education** in ‘Basic Model’ as well as ‘Augmented Model’ were higher for the teaching workforce of public sector technical educational institutions as compared to the teaching workforce of private sector technical educational institutions which is consistent with the finding of Afzal (2011) for the workforce of educational institution in general. However it was higher in case of non-teaching workforce of private sector as compared to the public sector non-teaching workforce. Coefficients of education shrink remarkably in case of ‘Augmented Model’ which confirms that the added variables in this model do affect the returns to education. Highest shrink has been found for the teaching workforce of public sector technical educational institution. This means that variables other than education and experience that affects the individual’s earnings are more important for the teaching workforce of the public sector technical educational institutions. Rate of returns to education was found to be less for the teaching workforce of private sector technical educational institutions as compared to the public sector technical educational institutions. But it was higher for non-teaching workforce of private sector as compared to the public sector non-teaching workforce. However in ‘Basic Model’ as well as ‘Augmented Model’ results showed in Table 5.6 that the impact of experience on the workforce earnings is higher for the private sector teaching and non-teaching workforce as compared to the public sector technical educational institutions workforce.

Factors that contribute positively and significantly towards the earnings of the **public sector teaching workforce** of the technical educational institutions presented in Table 5.5 are years of schooling completed, actual experience, gender and the family status. For the earnings of **non-teaching workforce of public sector** the result in Table 5.5 reveal that years of schooling, experience, gender and foreign language proficiency are the variables that positively and significantly contributed while family background is the variable which positively but insignificantly contribute in the respondent’s earnings.

For the **teaching workforce of private sector**, the result in Table 5.6 reveal that variables that effect the earnings positively and significantly are years of schooling completed, actual work experience, computer use, training acquired, family status and family background. As for **non-teaching private sector** workforce, education, actual experience, foreign language proficiency and family status are the variables that contribute positively and significantly in the individuals earnings while training acquired, gender and family background are the factors that also have positive but insignificant impact on individuals earnings. Variables that negatively affect the individual’s earnings are computer use and SSC.

The ‘**Augmented Model**’ of public sector in Table 5.5 revealed that returns to education found to be higher for the **non-teaching workforce** of technical educational institutions (8.9 percent) as compare to their counterparts of **teaching workforce** (8 percent). Similarly, for the **private sector** also Tables 5.3 shows that the rate of returns to education was higher (13.9 percent) **non-teaching workforce** in comparison to **teaching workforce** (5.9 percent). **In case of public and private teaching workforce**, it has been found that rate of returns to education the **public sector teaching workforce** were higher (8 percent) than the **private sector teaching workforce** (5.9 percent). In comparison to this **in case of public and private non-teaching workforce**, results shown in Table 5.5 present that rate of returns to the **private sector non-teaching workforce** were higher (13.9 percent) than the **public sector teaching workforce** (8.9 percent).
The results in the Table 5.5 ‘Augmented Model’ for the public sector workforce reveals that the returns to experience were higher (3.2 percent) for the teaching workforce than the non-teaching workforce (2 percent). For ‘Augmented Model’ private sector workforce Table 5.6 returns to an extra year of experience was higher for non-teaching workforce (8 percent) than the teaching workforce (6 percent). In case of teaching workforce of public and private sector results in Table 5.6 revealed that returns to experience were higher for the private sector teaching workforce (6 percent) as compare to the public sector teaching workforce (3.2 percent). Results of Table 5.6 for non-teaching workforce of public and private sector showed that returns to experience found to be higher in case of private sector (8 percent) as compared to public sector (2 percent).

Result of ‘Augmented Model’ private sector given in Table 5.5 also indicates that impact of trainings on the earnings of the teaching workforce of private sector technical institution were higher (16.8 percent) than the non-teaching (8.5 percent). Which mean teachers with the formal trainings earn 16.8 percent more in case of private sector technical educational institutes than the teacher with no formal trainings and in case of non-teaching respondents the one with the formal trainings earn 8.5 percent more than the one with no formal trainings. Formal training acquire by the respondent was negatively but insignificantly contributed only in case of public sector which is consistent with Afzal (2014) study in case of teaching workforce of public sector educational institutions. Furthermore if we compare the computer use for teaching workforce of private and public sector technical educational institutions it was found that it was higher in private sector (15.1 percent) as compare to the public sector (2.9 percent). This means that in private sector teacher who use computer earn 15.1 percent more than that of the teacher who don’t use computer.

Gender gap results in the Table 5.5 for ‘Augmented Model’ the private sector workforce reveal non-teaching workforce tends to be high (6.5 percent) as compare to the teaching workforce (5.9 percent). This means that male non-teaching workforce 6.5 percent and male non-teaching workforce earn 5.9 percent more than their counter parts (Afzal, 2014).

Non-teaching workforce with the foreign proficiency have higher impact (8.7 percent and 7.6 percent of private and public sector, respectively) on earnings than the teaching workforce (4.5 percent and 0.5 percent of private and public sector, respectively) as revealed in Table 5.6. Which means that non-teaching workforce public sector with the foreign language proficiency earns 7.6 percent and non-teaching workforce private sector earns 8.7 percent more than the workforce with their counterparts. For teaching workforce of private and public sector Table 5.6 shows that effect of foreign language proficiency on earnings was higher for private sector teaching workforce (4.5 percent) than the public sector teaching workforce (0.5 percent). And the results presented in Table 5.6 for the non-teaching workforce of private and public sector has been found that it was higher in case of private non-teaching workforce (8.7 percent) than the public non-teaching workforce (7.6 percent).

From the results given in Table 5.4, reveals that family background has been found to have highest (0.4 percent and significant) impact on individual’s earnings in case of the teaching workforce of private sector. As for the teaching workforce of private and public sector the results given in Table 5.5 shows that it is higher (0.4 percent) for the private sector teaching
workforce than that of public sector teaching workforce (0.1 percent). Table 5.6 results for the non-teaching workforce of private and public sector exposed that effect of family background on respondent’s earnings was higher (0.1 percent) in case of public sector as compared the private sector non-teaching workforce (0.2 percent).

Impact of family status on earnings was found highest (0.7 percent) in case of non-teaching workforce of private sector given in Table 5.6. This means that people with the strong family status earn 0.7 percent more that its counterparts in case of non-teaching workforce of private sector technical educational institutions.

The results given in Table 5.4 and 5.3 shows that estimated coefficients associate with the actual work experience is positive and statistically significant for all models, however for the experience square term, the coefficient associated with the variable is negative which reveals parabolic association between earnings and actual working experience for each category of models. This implies that experience-earning profile is concave that is diminishing rate of return to actual work experience after a specific working experience. Concavity means earnings increases with the increase in actual work experience but at a decreasing rate.

The significance of the estimated coefficients associated with education, actual work experience and training variables shows the validity of Human Capital Model for the workforce of technical educational institutions of Pakistan. The higher returns associated with education, actual work experience and training variables provide a clear support to the human capital theory in case of the workforce working in technical educational institutions of Lahore, Pakistan.

Conclusion and Recommendations

The current study has been carried out to measure the earning differentials of the workforce working in technical educational institutions of District Lahore of Punjab, Pakistan. The primary data based on the sample of 1168 respondents through using the survey method by questionnaire has been used collected by the researcher herself. It has been found that public sector respondents earn more although they spend less hours than the private sector respondents. The lowest marginal rate of returns to education has been found for the non-teaching workforce of private sector technical educational institutions.

Variables that positively and significantly contributed towards the earnings of the respondents are years of schooling completed, actual working experience, training acquired, gender, foreign language proficiency, family status and family background in case of private as well as public sector technical educational institutions. Factors such as education, actual experience and gender found as a positive and significant contributor towards the earnings of the teaching and non-teaching workforce of private and also the public sector educational institutions while foreign language proficiency was significant in case of non-teaching workforce of public sector and family background in case of teaching workforce of private sector. Factor such as years of schooling, actual experience, gender, foreign language, and family background positively contributed in the earnings of teaching and non-teaching workforce of private as well as public technical educational institutions of Lahore. Returns to experience were higher for the teaching workers of public sector technical educational institutes.
Higher returns couple with education, actual work experience and training gives a clear cut support to the ‘Human Capital Theory’ for the workforce working in technical educational institutions of Lahore, Pakistan. Furthermore, in current study concavity has also been observed in experience-earning profile.

**Recommendations:** *some recommendations are suggested keeping in view the above finding:*

I. While formulations of development policies major factors that determines the earnings found in the current study should be taken under consideration in order to increase the earnings status of technical educational institutions in Pakistan.

II. Earnings of the private sector teaching workforce must be raised at least to the extent or equal to the teaching workforce public sector technical educational institutions to raise their productivity and also to promote education.

III. Attainment of formal training which is a part of person’s along with the institutional productivity should be raised for all respondents whether it’s teaching or non-teaching. There is need of such institutions that can train individuals to meet with the needs of rapidly changing technology.

IV. Strong steps must be taken to raise the earnings of female workforce.

V. To minimize the earning differentials among various occupation (i.e teaching & non-teaching workforce) as well as gender workforce earnings, development programs must restructured and rationalized.

**References**


Examining the Dimensionality of Social Media Marketing in Sri Lankan Hotel Industry

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Abstract: Customers when making travelling arrangements, their source for hotels recommendations are the trusted sites through the internet. Star graded hotel are aware of the effects for taking the competitive advantage as the benefits of social media marketing. It is necessary for the hotel to take the direction for attracting of customer have to be measured the significant for utilization of social media. Therefore, in this research examines the appropriateness of social media as a way of marketing to the hotel sector in Sri Lanka and universal sampling was adapted. A requirement of social media is integrating the strategies before implementation for positioning. Therefore, assessed the dimensionality of social media marketing through communication, transaction and distribution and used items were fitted with the Sri Lankan hotel industry.

Key Words: Social media marketing, Sri Lankan hotel Industry, Dimensions of Social media marketing: Communication, Transaction and Distribution

Introduction
The hotel industry made a significant contribution to the tourism industry of the economy and also attracted it as a tourist destination on an international level to the country. Lim (2010) explained that the hotel industry can utilizes the networking and social media in which, they know how to engage with customers to identify their requirements. The hotel industry has a possibility to cooperate with the consumers where they can get a vacation experience using these networking sites. Furthermore, he described that social media is moderately new and benefits are great and affordable in which have a possibility to extend the brand reputation quickly.
It may have a variety of advantages of the social media marketing; hotelier and consumers engage with the communications in which the total cost of investment is small but which will direct to the brand reputation of the hotel eventually. One of the basic things of social network is the low cost in which they have to request the time for investment. In order for that, the hotel industry should position obvious aims to use the social networks and there should be the correct marketing strategies to success at the significant business.

Social media as an online marketing tool that is a vital resource for establish a competitive advantage within the hotel industry. For a Developing hotelier guest relationship is essential for the day-to-day activities, as well as future development. Currently, the hotel industry engages with online marketing to match the requirements of the international marketing order; also it highlights the offering services fitting into the existing context when showing the guests’ needs and wants. The hotel industry now is considering adopting social media in its resource base view. As a result, they want to keep ahead of the competition. Thus this necessitate investing in the marketing that is fast and new beneficial way of the future for internet marketing

Social media is the only printing, visual and two way communication method that the hotel industry uses for their day to day communication when compared with the other communication methods. As a result, it is easy to address the target customers for the existing vacancies within the hotels. Therefore, top management in the hotels should be involved with the planning methods of technology adoptions to attract more customers for their hotels; as it is based on previous experience, interests, needs, and financial potential of customers. As a result, the utilization of social media construct is vital in improving customer attraction and satisfaction in order to create a competitive advantages within the hotel industry.

**Problem Statement**

The competition within the hotel industry is continually increasing due to the globalizing environment in which the social media has a vital role for achieving competitive advantage in the competitive business world (Hamid, et al, 2012). Hoteliers can track the number of conversations that take place over a new product or service that is offered by them and can immediately
respond to reviews, comments and feedback. As a service leading industry; the hotels sector has to be very customer-centered.

The usage of the social media has been popularized among the people who are in USA and European countries rather than Asia and Australia. The highest global arrival of tourists was reported as 421,037 who visited from Western Europe in 2013 (Sri Lanka Tourism Development Authority, 2013). According to the Case and King, 2013, where they pointed out that in Europe, North American and South American, the people engage with social media at 46%, 40% and 50% respectively. The Sri Lankan hotel industry are also centralized with the customers who are from Europe and American countries in which the Sri Lankan hotel industry would have the potential to use social media to promote and popularize their services internationally through online marketing. On one hand, it provides a new way to reach out to the target audience and engage with them. (www.42inception.com). Social media have primarily focused on its use as a marketing tool (Baker and Green 2008a, Hampp 2009). Mainly the internet is used as a marketing tool in major tourism destinations in the Arab region such as Lebanon, Egypt and Syria (AL-Allak, 2010). Identifying the competences for the hotel, it is more likely to survive and stay successful in the markets. Hence, this study analyses the grounds for a dialogue between the Sri Lankan hotel industry and social media as a marketing tool for competitive advantages in which have to examine the dimensionality of social media marketing of Sri Lankan hotel industry.

**Research Methodology**

This study is cross sectional and the unit of analysis is organizational, due to the testing of the factors of the Hotels. The sample size is 98 which is the universal sampling as a result and data were collected from individual employees who are in the executive grade in the hotels to test the diamentions to achieve the more generalize finding from the hotel industry (Saunders, et al., 2007). It was also noted that, number of social media related studies (Castaneda et al., 2007; Huang and Law, 2003) have used the cross sectional research design method.

**Examining the Dimensionality of Social Media Marketing in Sri Lankan Hotel Industry**
Three sub dimensions; communication, transaction and distribution in which there are 5 items, 5 items and 3 items in the construct respectively. Each item in the social media is measured on a Likert scale of 1 to 5, where a response of 1 strongly disagrees; while a response of 5 indicates strongly agree to the statement. But, web site age is measures on ordinal scale. The descriptive statistics and the inter-item correlation values are given in Table 1.

**Examining the Dimensionality of Social Media Marketing: Communication**

Based on the mean values in Table 1, there seem to be an agreement in all the 5 statements on social media marketing: communication. The highest correlation for each item with at least one other item in the construct is between 0.3 and 0.9. Hence, all the 5 items correlate adequately in the construct. The Kaiser-Meyer-Olkin (KMO) value is 0.904 and Cronbach's Alpha value of 0.938 which are considered to be good. A single factor was extracted that explained the 80 % of the variation in the 5 items. The smallest factor loading is 0.719 (> 0.5: Hair at al, 2010).The mean of the 5 item was computed and saved as (MeanFCSC) social media marketing: communication to be used for further analysis.

**Table 1: Descriptive Summary and inter-item Correlations for items in SM Marketing: Communication**

<table>
<thead>
<tr>
<th>Descriptive statistic</th>
<th>Mean</th>
<th>Std.Dvi.</th>
<th>Inter-Item Correlation Matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.Accessing &amp; organizing information</td>
<td>4.14</td>
<td>.352</td>
<td>1.00</td>
</tr>
<tr>
<td>2.Interactivity process</td>
<td>4.19</td>
<td>.391</td>
<td>.740</td>
</tr>
<tr>
<td>3.Customer relationship management</td>
<td>4.21</td>
<td>.405</td>
<td>.739</td>
</tr>
</tbody>
</table>
Examining the Dimensionality of Social Media Marketing: Transaction

Based on the mean values in Table 2, there seem to be an agreement in all the 5 statements on social media marketing: transaction. The highest correlation for the each item with at least one other item in the construct is between 0.3 and 0.9. Hence, all the 5 items correlate adequately in the construct. The Kaiser-Meyer-Olkin (KMO) value is 0.792 and Cronbach's Alpha values the 0.812 which are considered to be good. A single factor was extracted that explained the 58% of the variation in the 5 items. The smallest factor loading is 0.500 (> 0.5: Hair at al, 2010). The mean of the 5 item was computed and saved as (MeanFCST) social media marketing: transaction to be used for further analysis.

### Table 2: Descriptive Summary and inter-item Correlations for items in SM Marketing: Transaction

<table>
<thead>
<tr>
<th>Descriptive statistic</th>
<th>Mean</th>
<th>Std.Dvi.</th>
<th>Inter-Item Correlation Matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std.Dvi.</td>
<td>1.</td>
</tr>
<tr>
<td>1. Sales to customers</td>
<td>4.14</td>
<td>.343</td>
<td>1.000</td>
</tr>
<tr>
<td>2. Transaction processing</td>
<td>4.19</td>
<td>.393</td>
<td>.594</td>
</tr>
</tbody>
</table>

www.ijsrp.org
Examining the Dimensionality of Social Media Marketing: Distribution

Based on the mean values in table 3, there seem to be an agreement in all the 3 statements on social media marketing: distribution. The highest correlation for each item with at least one other item in the construct is between 0.3 and 0.9. Hence, all the 4 items correlate adequately in the construct. The Kaiser-Meyer-Olkin (KMO) value is 0.724 and Cronbach’s Alpha value the 0.851 which are considered to be good. A single factor was extracted that explained the 77 % of the variation in the 3 items. The smallest factor loading is 0.728 (> 0.5: Hair at al, 2010).The mean of the 3 item was computed and saved as (MeanFCSD) social media marketing: distribution to be used for further analysis.

Table 3: Descriptive Summary and inter-item Correlations for items in SM Marketing: Distribution

<table>
<thead>
<tr>
<th>Descriptive statistic</th>
<th>Inter- item correlation matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Descriptive statistic</td>
</tr>
<tr>
<td>1. Inventories &amp; utilities</td>
<td>4.24</td>
</tr>
<tr>
<td>2. Supply chain</td>
<td>4.35</td>
</tr>
<tr>
<td>3. Distribution cost &amp; time</td>
<td>4.39</td>
</tr>
</tbody>
</table>
Concluding Remarks

The social media gives a chance to the expected guest the freedom of speech and shearing of their view in which hoteliers can carry on their communication transparently. If the customer can login with their information online in which the hoteliers should maintain the successful and visible promotion for internet marketing.

Social media is playing a fundamental task for marketing and sharing information with each other. It connects people and the exchange of opinions. The hotel industry can create a greater opportunity with social media which is fortunate to all of the hotels in Sri Lanka they truly know how to create for it to take place. Therefore, the hotels are fully aware with the strategies of social media, in which many of the opportunities can be accumulated from the social media.

The hotel industry in Sri Lanka has and focused toward the social media marketing by using the social media as a marketing tool for building long-run relationships with the customer. Utilizes items of the question for communication, transaction and distribution are more appropriate to assess the states of social media marketing in Sri Lankan hotel industry. These findings are in accordance with the argument made by Pervaje (2011) and Teece et al., (1997). Eisenhardt and Martin (2000), that emphasis that the new product and development of services are included in the dynamic capability as a result of rapid technological changes that help to enhance the wealth creation in the firms.

References


Factors affecting females’ participation in leadership positions in RMG industry, Bangladesh

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Abstract- This paper aims to examine the use of succession planning, flexibility and communication to ensure female participation in the leadership positions in the Ready Made Garments (RMG) industry of Bangladesh. Study used quantitative strategy and cross-sectional survey method to collect the data from 250 employees with education level of intermediate to masters. Results demonstrated that more than 90% of participants rated the level of succession planning, flexibility and communication used in RMG organisations as low to bring females into leadership positions. Since, no study identifying the use of three antecedents in Bangladesh has been conducted so far, significance of this study lies in highlighting the exact antecedents to be improved in RMG organizations of Bangladesh to increase female participation in leadership positions.

Index Terms- RMG, Succession Planning, Flexibility, Communication, Participants, Leadership

I. INTRODUCTION

Participation of females in the workplace has been increased in recent years in poor and developing countries along with emerging and developed countries (EU, 2013; Saunders, 2016; BGMEA, 2017). They have been key workforce in many industries of different countries remarkably in Ready Made Garments (RMG) industry of Bangladesh where more than 85% workers are females. RMG industry has emerged as biggest earner of foreign currency for this developing country situated in the South Asia (Rahman, 2015; BGMEA, 2017). Due to increasing demands of garments worldwide and availability of cheap labor in Bangladesh, it has created ambitious target to earn more than $50 billion by 2021 however the sector contributed more than $26 billion in the year 2016 (BGMEA, 2017; Leahey, 2015; Daily Star, 2017). The industry employs 4.2 million workers in 2017 while majority of workers are females (BGMEA, 2017). In spite of contribution and number, the participation of females in leadership positions/managerial positions has consistency lower than men in this economically vital industry of Bangladesh.

According to WTO, the RMG sector might reach $650 billion but it stands now $483bn (Zamir, 2016). On the other hand, due to increase of labour costs in other major RMG producing countries such as Vietnam, Sri-Lanka, Mexico China, garments manufacturing companies have been shifting their factories into new locations such as Bangladesh, Pakistan, India etc (Schwab, 2017; Yunus and Yamagata, 2012; Deniel, 2017) BTT National Desk, 2015). Therefore, Bangladesh has reasonable chance to increase its exports to western and other buyers and even can gain its target by assigned period, 2021. According to Tyagi, (2016) found that organizations with more women in the leadership roles perform better than organizations with fewer women in the leadership roles. It is supported from the research results of Mori and Towo (2017) and EU (2017) that the boards of director with women perform better and tends to gain high profitability and have positive impact on the female human resources. Additionally, similar view has been found from the research of Fitch and Agrawal, (2015) that female leaders in senior positions are more engaged than male leaders. Hence, these results urge that participation of females in leading roles in the organizations of Ready Made Garments (RMG) industry of Bangladesh would bring better organisational performance. According to ILO (2015), presence of women in managerial positions in Bangladeshi business organizations is substantially low although a quiet revolution of women participation in workplace has been examined in recent years. The report of ILO in 2015 on women’s representation in senior roles in Bangladeshi organizations published that only 5.4% positions in managerial roles are occupied by female counterparts (ILO, 2015). Mostly similar report is examined from Grant Thornton (2015) on females’ presence in senior roles in South Asian Countries where women possess less than 15% senior roles. According to ILO (2015), it is necessary for Bangladeshi business organizations to discover what are the factors prohibiting females to be outnumbered in senior positions even though they have both qualification (Rahaman, et el., 2016) and experience (IMF, 2017; EU, 2014). If the organisations in the RMG industry and other industries succeed in employing higher numbers of women in the leading positions, it will be easy for them to gain higher productivity (Oakley, 2000; European Commission, 2014; Greer and Virick, 2008; Broughton and Miller, 2009; Aguirre et al, 2012).

Numerous studies have identified significant factors, which are needed to apply to increase numbers of female in leading positions such as motivation, flexibility, succession planning, communication, positive organisational culture, reducing patriarchy, fair salary and promotion, equality, health and safety, dignity etc (Zahidi and Ibarra, 2010; Sanderson and Whitehead, 2016; Hakim, Lumby, 2011; Whitehead, 2014; Ogunsanya, 2007). However, almost all of research works relating to the female participation in leading positions have been carried or tested in western countries and different organizational, industrial and cultural contexts.
However, no study so far, has been conducted to identify either the succession planning, flexibility, and communication are applied to ensure female participation in leadership positions in RMG organizations of Bangladesh or not. Therefore, this study aims to present the level of use of succession planning, flexibility and communication to increase female participation in the leadership position in selected industry only. Consequently, this study aims to help decision makers in RMG organizations and government bodies to develop robust and customised policies/strategies by knowing exact undiscovered antecedents for increasing female participation in leadership positions in the RMG industry.

2. LITERATURE REVIEW

2.1 SUCESSION PLANNING

According to Butler and Roche-Tarry (2002); Kowalewski et al., (2011), succession planning contributes companies to be ready for future critical vacancies of senior and middle management positions. Kim (2003); Karaevli, and Hall, (2003) and Berke (2005) defined the succession planning as the process through which an organisation ensures employees are developed or recruited regardless of their gender to fill each key role. It entails developing or making capable internal employees with potential to fill leadership positions when vacant (Kerr, 2004; SUFF, 2011; Groves, 2007).

According to Butler, & Roche-Tarry, (2002); Kowalewski, Moretti, and Denny, (2011) and Conlon, (2008); CIPD, (2016), effective succession planning facilitates the availability of capable and experienced employees to fill vacant leadership positions due to retirement of leading or managerial personnel in organizations. The success of succession planning is determined on the basis of the percentage of jobs e.g. senior positions or leadership positions filled by internal candidates (Busine and Watt, 2005; Charan, et al., 2001). In this respect, Hearing, (2016) and Greer and Virick (2008), defined succession planning, as it is the process of getting right people on board in the right roles.

According to CIPD (2016); Suff, (2011); Hirsh, (2000), succession planning ensures greater openness and diversity and closer links to wider talent management practices in the organisation regardless of gender issue. Barsh, et al., (2013) found, “When an organisation has a succession plan and it looks at current and future openings therefore to be fair with female, it needs to be intentional about how to place female in those roles.

In addition, there are number of studies, which have found that implementing succession planning in organizations can contribute to develop diversity and bring women at managerial positions according to their qualification and experience (Conger and Fulmer, 2003); Doyle-Morris, 2017; Barsh et al, 2013). In the most companies in western countries, the top personnel are encouraged to create relationships with potential future women leaders and to serve as their role models or sponsors to ensure right and effective succession in the vacant positions that might be evolved in future (Barsh, et al., (2013); PWC (2008); Blink, 2015). Realistically, IBM, a leading technology company announced a female as their new CEO that is considered a remarkable transition showing an example of world-class succession management for a female to access in leading position (Bersin, 2011). Kowalewski, et al., (2011) Greer and Virick (2008) suggested based on their research outcome that companies should have succession planning and apply it to promote women into top-level positions and cultivate diversity in leadership positions.

2.2 FLEXIBILITY

Wallen, (2002); Piterman (2008); Vandello et al, (2013) have found in their researches that poor flexibility in the working hours is responsible for loss of female talent from management. Muir and Hong, (2014) and Kelliher & Anderson, (2010) have demonstrated flexibility has a positive and powerful effect on women participation in workplace and their retention in long run in similar organisation. Flexibility encourages women to climb up since it not only creates opportunity to make effective balance in life but also offer potential leave rather than full time leave (Australian Institute of Management, 2012; Aguirre, et al, 2012; Adema, 2014). Many females leave their jobs due to family responsibilities and to educate and rear their children, therefore, they cannot access into the leadership positions even with both experience and potentiality (Saunders et al, 2016). According to Broughton and Miller, (2009) EU, (2014), if there were flexibility at workplace, women would not leave the organisation but could become encouraged to take leading roles spontaneously.

According to Pit-Catsoupes et al, (2009); Eaton (2003), and Schokley and Allen (2007) flexibility in the workplace allows both employees and employers to make working hours or arrangement according to their mutual conditions that suit them. It is also found that flexibility eases the process of creating work/life balance therefore women can engage in the workplace for long run maintaining all sorts of family and other responsibilities (Arbon, et al, 2009; Allen, 2009). As a result, long time experience of females makes them proficient to take roles in the senior positions (Piterman (2008). This is supported
by the findings from Kelliher & Anderson, (2010); Hellicar, (2013); Sanders et al, (2016) that flexibility boosts confidence and interest of women to take senior roles and serve for longer period in the organizations.

2.3 COMMUNICATION

According to Nobel and Birkinshaw (1998), communication is defined as the process of transfer of meaning between two or more people through different communication channels. The basic and most common modes of communication are written (e.g., emails, faxes, and letter), oral (e.g., discussions, meetings, phone call) and nonverbal (e.g., body language). The main functions of communication in the organizations include information diffusion, control, emotional expression and motivation (Tsai, 2006; Robbins and Judge, 2007).

An employee in leadership position has to take many decisions efficiently and even quickly that requires right information to make them effective and fruitful (Wright and Snell, 1999; Kreitz, 2007; Rausch et al., 2001; Roy, 2012). According to Harshman and Harshman (1999); Altinöz, (2008); Chen, (2008) communication plays significant role in collecting information from different sources to identify and evaluate alternative choices of certain issue to take right decision. Femi, (2014) have added that communication represents the values, choices, and beliefs of the leaders in the case of decision in the company and leading employees. Therefore, miscommunication would result in the week leading capability and internal and external problems and chaos (Hamm, 2016; Femi, 2014). In addition, organisational scandals could have occurred that is evidenced in the research of Seeger et al., (2003) identified lack of communication as one of the main causes for corporate scandals within organizations. Effective communication skill to contact with different stakeholders (employees, suppliers, government agencies, competitors) has been identified as a main requirement for an employee to take leadership role in an organization (Hermitia, Ely, and Kolb, 2013; Cheney, 2007). According to Halim and Razak (2014); Merchant, (2012); Chuang, (2013) regardless of the gender, the person, who like to access in the leadership position must attain effective communication skill to be successful in leading his or her employees and achieve organisational goals. In this regard, Barret, (2004); Patel, (2013) and Miller, (2017) have found that women without understanding the use of workplace communication strategies in the organisation, they cannot take leadership roles since it is foremost requirement for leaders to lead their followers in every sector. From this view, it is established that the communication is required for females in the organisation to access in the leadership positions.

3. HYPOTHESIS

In light of reviewed literature, found gap and objective of research, following hypotheses are proposed for investigation.

**Hypothesis 1:** There is succession planning to ensure female participation in leading position in the RMG organisations of Bangladesh.

**Hypothesis 2:** There is flexibility to ensure female participation in leading position in the RMG organisations of Bangladesh.

**Hypothesis 3:** There is communication for female participation in leading positions in the RMG organizations of Bangladesh.

4. METHODS

4.1 MEASURES

Questionnaires were used to collect the data for this study. The questionnaire was made up four sections: A, B, C and D. Section ‘A’ included on the socio-economic and demographic status of the respondents. Subsequently, the section ‘B’ included 6 items concerning the succession planning with regard to female participation in the leadership positions in the RMG industry. Section ‘C’ comprised 10 items on the flexibility with regard to female participation in the leadership positions in the RMG industry. The final section ‘D’ was made of 10 items on the communication with regard to female participation in the leadership positions in the RMG industry. Different conditions given in the form of questions were measured on a 5-point semantic scale where 1 denoted “Succession planning or flexibility or communication are used to ensure participation of female in leadership positions” and 5 denoted “Succession planning or flexibility or communication are used to ensure participation of female in leadership positions”. Questionnaire measures employees’ response in terms of “Low”, “Moderate” and “High” to the existence of succession planning, communication and flexibility in the RMG organizations. The explanation of the scores low, moderate and high has been given in the following table:

<table>
<thead>
<tr>
<th>Use of Succession planning</th>
<th>1-15 denotes</th>
<th>16-25 denotes</th>
<th>25-30 denotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Use of Flexibility</th>
<th>1-25 denotes</th>
<th>26-40 denotes</th>
<th>41-50 denotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Use of Communication</th>
<th>1-25 denotes</th>
<th>26-40 denotes</th>
<th>41-50 denotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Moderate</td>
<td>High</td>
<td></td>
</tr>
</tbody>
</table>

Twenty-six (26) questions were formed and adapted from an extensive literature review, from the work of (Pit-Catsouphes, et al., 2009; Forris, 2015; Harp, 2011; Rosenwald and Wendell, 2014). Accumulated mean scores of the six factors, independency and in a combined form can also be calculated to evaluate the use of succession planning, flexibility and communication to ensure women participation in leadership positions in the RMG industry.
positions. Higher the score, the more agreement respondent showed high use of those factors to ensure women participation in the leadership positions. This type of instrument has been used and validated by the different types of previous studies conducted in different cultures and the different contexts (i.e. see Rush et al, 1995, 1991; Nelson and Sutton, 1990; Forris, 2015; Harp, 2011). The questionnaire also includes information related to participants’ demographics mentioned in table 3, section 5.2.

4.2 SAMPLED POPULATION

Hemayetpur, Saver, Bangladesh was selected as the research backgrounds because it is one of the garment manufacturing hubs in the country (Daily Star, 2017). There are many big garment-manufacturing factories in this area exporting cloths to different western and other countries (BGMEA, 2017; BBC, 2017). The target population was the employees working in the different levels in different factories. Two hundred and fifty (250) employees with education level of Intermediate to Masters working in RMG organisations were randomly given the invitation with questionnaire to participate in this study. Only educated employees working in RMG organizations have been selected because educated people tend to climb up in higher positions in the organizations and potential to take leadership roles in complicated work environment.

4.3 PRE-TESTING

The questionnaire was written in English and pre-tested on 10 employees working in the RMG organizations in Hemayetpur, Saver. All the participants were encouraged to ask questions as this facilitate amendments of the questionnaire if there were any difficulties to understand the questions. According to the participants in the pilot study, questions were comprehensible.

5. RESULT

5.1 RELIABILITY

In order to see the reliability of the collected data, Cronbach’s Alpha test was used. Cronbach’s Alpha test showed a score of 0.79, 0.78, and 0.74, for role succession planning, flexibility and communication, respectively. Reliability score for complete instrument was 0.94. Since the obtained scores were relatively high and within the good range, thus showing high reliability of data for further analyses.

5.2 RESPONDENTS’ PROFILE

Table 3: Demographic table of respondents

<table>
<thead>
<tr>
<th>Variables</th>
<th>Values</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Below 20</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>21-30</td>
<td>48%</td>
</tr>
<tr>
<td></td>
<td>31-40</td>
<td>38.4%</td>
</tr>
<tr>
<td></td>
<td>41-above</td>
<td>13.6%</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>16%</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>84%</td>
</tr>
<tr>
<td>Education</td>
<td>Intermediate</td>
<td>28%</td>
</tr>
<tr>
<td></td>
<td>Undergraduate</td>
<td>60%</td>
</tr>
</tbody>
</table>

5.3 USE OF SUCCESSION PLANNING, FLEXIBILITY AND COMMUNICATION

Table 4 shows that use of all 3 factors included in the survey is low in the RMG organizations to ensure females are in leadership positions.

Table: 4: Frequencies, mean average and standard deviations of Use and level of Succession planning, flexibility and communication

<table>
<thead>
<tr>
<th>Succession Planning</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Level of the use of Succession Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Low (6-15)</td>
</tr>
<tr>
<td></td>
<td>11.34</td>
<td>1.677</td>
<td>98.2%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flexibility</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Level of the use of Flexibility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>21.53</td>
<td>2.545</td>
<td>Low (1-25)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>96.7%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Communication</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Level of the use of Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>21.69</td>
<td>2.354</td>
<td>Low (1-25)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>94.4%</td>
</tr>
</tbody>
</table>

*Results are significant @ P<0.01

Second hypothesis undertakes that there is flexibility to ensure female participation in leading position in the RMG organisations of Bangladesh. Since, 96.7% participants voted that the use of the flexibility in the working processes or procedures in the RMG organizations is low therefore the second hypothesis...
is rejected. Third hypothesis views that there is communication for female participation in leading positions in the RMG organizations of Bangladesh. According to the results obtained through this study, 94.4% respondents have opined that the use of communication to ensure females in leadership positions in RMG organizations is low. Consequently, this hypothesis is rejected.

6. DISCUSSION

The primary aim of the study was to identify the level of use of succession planning, flexibility and communications in the RMG organizations to ensure female participation in the leadership positions. Results of the study showed very low use of those factors in the RMG organizations. According to Axelrod, (2002), Australian Institute of Management (2012); Adema, (2014), it is difficult for females to climb up into the leadership or senior roles if there is not succession planning in the organizations. The result of the study finds there is no succession planning in the RMG organizations. Therefore we can say lower use of succession planning creates barriers for females to access in leadership positions in the selected industry. Mostly similar results (i.e. lower use of flexibility and communication) are identified in RMG organizations therefore the existence of the females in the leadership positions is dramatically. According to Eaton, (2003); Hofacker and Konig, (2013) flexibility at workplace contributes to create work-life balance, which is significant to ensure both family and work are maintained effectively. Since, females play vital role to execute household works and responsibilities therefore flexibility in the workplace can inspire them to take leadership roles (Pit-Catsouphes, et al, 2009; Shockley & Allen, 2007). Thus, absence of flexibility in workplace fundamentally creates barriers to climb up into senior roles. On the other hand, communication is urgent for every employee to take effective decision in leadership roles regardless of gender (Seeger et al, 2003; Tsai, 2006; Femi, 2014; Harp, 2011) but result found lower use of communication in RMG organizations. Therefore, lower use communication processes such as mobile phones; email is a significant barrier for employees specially for females to take leadership roles.

7. CONCLUSION

The main objective of the study was to identify the level of use of succession planning, flexibility, and communication to ensure female participation in leadership positions in RMG organizations in Bangladesh. On the whole, this study shows that the use of three antecedents is low in the RMG organizations. Therefore, in order to develop female participation in the leadership positions in the surveyed organizations, it is pertinent to increase the usage of the three antecedents. The organizations after knowing the lower use of the succession planning, flexibility, communication, as identified in this study can devise customised strategies to ensure increased female participation in the leadership positions to improve the organisational productivity and equality in the leading roles.

8. LIMITATIONS AND FUTURE RESEARCH

This study used only selected factors relating to the female participation in leadership positions. It was beyond the scope of the study to see all the significant factors, which used or not to increase numbers of females in leadership positions. Future researches can be undertaken by adding more factors. Link of cultural factors with the female participation in the leadership positions in the RMG organizations in the Bangladesh can also be investigated.

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Green synthesis, Characterization and Antibacterial property of Silver Nanoparticles using *Ocimum tenuiflorum*, *Azadirachta indica* and *Plectranthus amboinicus* leaf extracts

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**Department of Zoology, N.S.S. Hindu College, Changanacherry, 686102, Kerala
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Corresponding author: Renuka M.R

Abstract - Silver nanoparticles (AgNPs) have received considerable attention due to their attractive physical, chemical, antimicrobial, anti-inflammatory and wound healing properties. This paper reports simple, cost effective and eco-friendly methods for the preparation of AgNPs using silver nitrate solution as the metal precursor using leaf extracts of *Ocimum tenuiflorum*, *Azadirachta indica* and *Plectranthus amboinicus*. The AgNPs obtained were characterized by XRD to analyze the particle size. The XRD patterns confirmed the purity, phase composition and nature of the synthesized nanoparticle. UV-Vis and IR spectroscopy was used as a tool to characterize AgNPs. The study also revealed that AgNPs synthesised from all the medicinal plant extracts had inhibitory activity on the gram positive and negative human pathogenic bacteria *Bacillus* and *Klebsiella*. The broad spectrum of bioactivity of AgNPs makes them promising agents not only to fight infections, but in many other biomedical areas.

Key words: Green Synthesis, XRD, Spectral analysis, Antibacterial study

I. INTRODUCTION

Nanotechnology is one of the modern techniques of material science. The small sized nanoparticles mean they exhibit enhanced or different properties when compared with the bulk material. The most effectively studied nanoparticles today are those made from noble metals, in particular Silver (Ag), Platinum (Pt), Gold (Au) and Palladium (Pd). Especially silver have drawn the attention of scientists because of their extensive application in the development of new technology in the areas of electronics, material science, nanomedicines, nano-biotechnology and nanotoxicology. New applications of nano particles and nano materials are emerging rapidly. Therefore there is still need for economic, commercially visible as well as environmentally clean synthesis route to prepare silver nano particles (Choudhary R.S et al.,2014).

Physical and chemical methods are more popular for nanoparticle synthesis but the use of toxic compounds limits their applications (Hasna Abdul Salam et al., 2012) and also not economically feasible one. An eco-friendly green mediated synthesis of inorganic nanoparticle is a fast growing research in the limb of nanotechnology. (Sathy et al., 2012). The biosynthesis method employing plant extracts have drawn attention as a simple and viable alternative to chemical procedures and physical methods. The main phytochemicals responsible for the synthesis of nanoparticles from plant extracts are terpenoids, flavones, ketones, aldehyde amides etc. The emergence of nanoscience and technology in the last decades presents opportunities for exploring the bactericidal effect of metal nanoparticles also. The bactericidal effect of metal nanoparticles has been attributed to their small size and high surface to volume ratio, which allows them to interact with microbial membranes and is not merely due to the release of metal ions in solution (Seeram. Hariprasad. et al, 2016).

In this paper AgNPs was synthesized using the extract of *Ocimum tenuiflorum*, *Azadirachta indica* and *Plectranthus amboinicus*. The bacterial strains used for the study include *Bacillus species* and *Klebsiella species*. *Bacillus* is a rod shaped, gram-positive bacteria and *Klebsiella* is a genus of gram negative, rod shaped bacteria with a prominent polysaccharide-based capsule.

The main objectives of the study includes i) Green synthesis of AgNPs using plant extracts from *Plectranthus amboinicus*, *Ocimum tenuiflorum*, and *Azadirachta indica*. ii) Characterization of AgNPs using X-ray Diffraction, UV-Vis Spectroscopy and FTIR spectroscopy iii) Particle size determination of AgNPs iv) Antibacterial study of AgNPs against gram positive (*Bacillus sp.*) and gram negative (*Klebsiella sp.*) bacterial strains.

II. MATERIAL AND METHODS

Preparation of Silver nanoparticles

The method involves collection of plant samples, preparation of aqueous extract of the leaf samples and synthesis of AgNPs. The leaves selected were *Ocimum tenuiflorum*, *Azadirachta indica* and *Plectranthus amboinicus*.
indica and Plectranthus amboinicus. The collected leaf samples were cleaned to remove adhering impurities, sand particles and dust. Then the sample was soaked in distilled water, washed and dried. 20 grams of dried leaves was boiled with 200 ml distilled water for 30 minutes. Then the resulting crude extract was filtered through Whatman no.40 filter paper. 100 ml of the aqueous solution of plant extract was added to 50 ml of 1 molar silver nitrate solution. The solution was allowed to react at room temperature. AgNPs formed was filtered, washed and dried. The dried samples were characterized using XRD and IR.

**Antimicrobial study**

1 milli molar silver nitrate solution was used for the study. 90 ml of 1 milli molar silver nitrate solution was mixed with 10 ml of plant extract. Sterilized nutrient agar medium was used to culture bacteria. The method followed for the antibacterial study was Kirby-Baur Disc diffusion method. Tests were repeated four times and the mean of zone of inhibitions produced were determined. Results are expressed as mean value of diameters of zone of inhibition for four replications. Using commercial antibiotic Ampicillin a control was also maintained for comparison.

### III. RESULT AND DISCUSSION

1. Characterization of silver nanoparticles

**XRD analysis**

Figure 1a, 1b and 1c shows the XRD of AgNPs obtained from different plant samples. The peaks corresponding to (111), (200), (220) and (311) planes of silver was observed and compared with the standard powder diffraction card of JCPDS (Silver file no.JCP2-03-065-2871). The XRD study confirmed that the resultant particles are (FCC) silver nanoparticles. Table 1 shows the determination of average particle size of AgNPs from four plant extracts.

![Fig 1a. XRD of Silver nanoparticle prepared from Azadirachta indica](image1)

![Fig 1b. XRD of Silver nanoparticle prepared from Plectranthus amboinicus](image2)

![Fig 1c. XRD of Silver nanoparticle prepared from Ocimum tenuiflorum](image3)

**UV-Visible spectroscopy**

UV – Visible spectra taken for all the 3 samples showed absorption peaks in the range 400 – 450nm. This is in good agreement with literature (Li T. et al 2007), clearly indicating the formation of AgNPs and is reported to be due to Surface Plasmon resonance. Figure 2, 3 and 4 shows the formation of AgNPs prepared from Plectranthus amboinicus, Ocimum tenuiflorum, and Azadirachata indica in comparison with the UV spectrum of the plain plant extract.

![Fig 2a UV visible absorption peak of Azadirachta extract](image4)
Fig 2b AgNPs from Azadirachta extract after 1 hour

Fig 2c UV visible absorption peak of Ocimum extract

Fig 2d AgNPs from Ocimum extract after 1 hour

Fig 2e UV visible absorption peak of P.amboinicus extract

Fig 2f AgNPs from P.amboinicus extract after 1 hour

Analysis of FTIR spectrum of AgNPs prepared by Ocimum tenuiflorum (tulsi) extract

The band at 3444.27 cm⁻¹ corresponds to either OH stretching of hydrogen bonded alcohol and phenols. The peak at 1592.7 cm⁻¹ corresponds to N-H bend primary amine. The band at 1340.38 cm⁻¹ corresponds to C-N stretching of aromatic amine and 1155.84 cm⁻¹, 1002.98 cm⁻¹ corresponds to CO stretch of alcohol, ethers, acid, anhydride. The peak at 1495.14 cm⁻¹ and 1434.64 cm⁻¹ is due to OH in plane of bending. Therefore the synthesized nanoparticles were surrounded by proteins and metabolites such as terpenoids having functional group of alcohols, ketones, aldehydes and carboxylic acid. From the analysis of FTIR studies we confirmed that the carbonyl group from the amino acid residues has the stronger ability to bind metal indicating that the proteins could possibly form a coating on the metal nanoparticles to prevent agglomeration and thereby stabilizes them. This suggests that the biological molecules could possibly perform dual
function of formation and stabilization of AgNPs in the aqueous medium [K.Mallikarjuna et al 2011]. Figure 5 shows the FTIR spectrum of AgNPs prepared by tulasi extract.

**Figure 3.** FTIR Spectrum of silver nanoparticles obtained from green synthesis

**iv) Antimicrobial Property of AgNPs**

AgNPs displayed antimicrobial activity against studied pathogenic microorganisms, with varying degrees, as suggested by the diameter of inhibition zone. Against treatment with bacillus species, commercial antibiotic ampicillin produced an average inhibition zone of 17.4, *ocimum* showed only 7.6, *Azadiricha* showed 9.8 and *Plectranthus* 8.6 mm. Gram negative bacteria *Klebsiella* was more susceptible to AgNPs as indicated by the zones of inhibition produced. Against treatment with *Klebsiella* ampicillin produced inhibition zone with diameter 14.8 mm where as AgNPs produced from *ocimum* produced very large inhibition zone measuring 18 mm in diameter. *Azadiricha* produced 10 mm and *plectranthus* 9.8 mm of ZOI. Figure 6 &7 shows the Zones of inhibition produced by *Bacillus* and *Klebsiella* respectively.

**Figure 5.** shows the zone of inhibition produced by *Klebsiella* Sp.

Gram positive bacteria bacillus showed smaller inhibition zones against AgNPs when compared with the antibiotic ampicillin. Whereas the gram negative bacteria *Klebsiella* developed larger inhibition zone with AgNPs synthesized from *ocimum*. It should be noted that morphology of the synthesized nanoparticles plays a very important role in the antibacterial property (Pham Van Dong et al., 2012). The Gram negative bacteria *Klebsiella* showed larger zones of inhibition, compared with the Gram positive bacteria *Bacillus*, which may due to the variation in cell wall composition. The cell wall of Gram positive bacteria composed of a thick peptidoglycan layer, consisting of linear polysaccharide chains cross linked by short peptides, thus forming more rigid structure leading to difficult penetration of the AgNPs, while in Gram negative bacteria the cell wall possesses thinner peptidoglycan layer (Rai et al., 2014).

AgNPs can induce cell death in bacterial cells inducing structural and morphological changes. When they come in contact with bacterial cells, AgNPs will adhere to cell membranes and go into the cell through the membrane. Within the bacterial cell they interacts with phosphate-containing compounds like DNA and RNA, while another portion adheres to the sulphur-containing proteins on the membrane. These interactions will cause the formation of pits and pores on the cell membrane resulting in the release of cellular components to the extracellular fluid due to the osmotic difference. Within the cell DNA replication is also prevented by AgNPs causing the death of the cell. Further increasing their effect, when silver comes in contact with fluids, it tends to ionize, which increases the nanoparticles bactericidal activity. This has been correlated to the suppression of enzymes and inhibited expression of proteins that relate to the cell’s ability to produce ATP. It has been seen that in general, AgNPs with an average size of 10 nm or less show electronic effects that greatly increase their bactericidal activity. This could also be partly due to the fact that as particle size decreases, reactivity increases due to the increase in the surface area to volume ratio (Kaur and Sharma, 2016). Table 2 and 3 shows the statistical analysis of the significance of the data obtained from

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**Figure 4.** shows the zone of inhibition produced by *Bacillus* Sp.

**Table 2 and 3.** Statistical analysis of the significance of the data obtained from
zone of inhibition produced by Bacillus and Klebsiella respectively.

IV. CONCLUSION
The present study concluded that the plants Azadirachta indica (Neem), Ocimum tenuiflorum (Tulsi), Plectranthus amboinicus (Panikkurkka) can be used as an excellent source for preparing AgNPs. In our study we used leaf as a source which is easily available, cost effective and environment friendly. The primary confirmatory for the AgNPs was colour changes, XRD and UV-vis absorption spectra. The particle size of AgNPs formed was approximately between 10-15 nm in size. FTIR spectrum of AgNps explains the role of biomolecules in performing the dual function of formation and stabilization of AgNPs in the aqueous medium. Antibacterial study revealed that AgNPs synthesized from all the medicinal plant extracts had inhibitory activity on the gram positive and negative human pathogenic bacteria Bacillus and Klebsiella. The inhibition zones were clearly visible on 24 hour incubation at 37°C. Significant difference were obtained in the inhibition zone diameters (IZDs) for AgNPs obtained from different plant extracts. This shows the difference in antibacterial potency of these plant extracts. The response of the test microbe with these extracts varies greatly. The Gram negative bacteria Klebsiella showed larger zones of inhibition, compared with the Gram positive bacteria Bacillus, which may due to the variation in cell wall composition. The broad spectrum of bioactivity of AgNPs makes them promising agents not only to fight infections, but in many other biomedical areas.

REFERENCES

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Correspondence Author – – Dr. M R Renuka, renujayan2000@gmail.com , Ph. 9446124601.
Study the Efficiency of Composted Herbal Biomass as a Source of Nutrients for Vegetative Growth and Nutritional Composition of Okra

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Abstract- Present study was aimed to determine the effect of herbal pharmaceutical solid waste compost on the growth, pod yield and nutritional value of okra. Compost was prepared by using herbal pharmaceutical solid waste in combination with cow manure under windrow composting technique. Three different doses i.e. 25, 37.5 and 50 kg Nha⁻¹ were applied to okra crop. The experiment was arranged in a randomized complete block design with three replications. Growth, yield, mineral and vitamins of okra were assessed. The results showed that various treatments had significant effects on growth, yield and chemical composition of okra above the control plants in which no compost was applied but among three doses application of 50 kg Nha⁻¹ herbal pharmaceutical solid waste compost significantly increased the growth, yield and level of minerals and vitamins.

Index Terms- Composting, herbal biomass, okra, nutritional composition

I. INTRODUCTION

The intensive use of inorganic fertilizers is causing adverse effects on the physical, chemical and biological properties of soil. The inadequate and imbalance use of chemical fertilizer is resulting in stagnant even low crop yields in Pakistan as compare to other developed countries. Due to high cost and unavailability of fertilizers at the time of application poor Pakistani farmers are using polluted municipal and industrial wastes as a source of nutrients and organic matter Younas and Shahzad (1998) and Jamal et al. (2002).

Herbal pharmaceutical waste (HPSW) from herbal pharmaceutical industry contains high concentrations of organic matter. It contains several herbs like saunf (Foeniculum vulgare), Bad-e-musk, balchar (Nardostachys Jatamansi), banafsha (Viola odorata), subistan and tea (Camellia sinensis). Presently in Pakistan herbal waste material is collected and dumped into the municipal landfills, resulting loss of potentially valuable organic material that can be processed as organic fertilizer Ferhan et al. (2010).

Recycling of organic waste into nutrient rich organic compost by composting method is a cost effective and environment friendly way. Composting is biological decomposition of organic matter under controlled condition Adegunloye (2009) and Popkin (1995). Organic inputs mainly of plant and animal origin are the good source of organic matter and nutrients Sharma et al. (2005). Composted organic waste materials not only sustain the fertility of the soil but also use least resources to produce high quality of nutritious food Batman et al. (1993). Many researchers Stone et al. (2003), Drinkwater et al. (1995), Lewis et al. (1992) and Trankner et al. (1992) have been reported that decomposing plant residues are not only release substantial levels of nutrients and organic matter into the soil but also improve soil functions and suppress soil borne diseases. Okra (Hibiscus esculentus) locally called Bhindi is an annual dicotyledonous herb belongs to the family Malvaceae. It is a warm season crop grown throughout the tropical and subtropical parts of the world. Okra is a powerhouse of valuable nutrients; it provides most of the dietary fibers, proteins, fats, minerals and vitamins in human diet. It contains approximately 86.1 % moisture, 2.2 % protein 9.7 % carbohydrates, 0.2 % fat and 0.9 % ash Ihekoro and Ngoddy (1985). Its medicinal importance also makes it a valuable addition to the diet Chiej (1984) and Facciola (1990).

Keeping in view the environmental problems associated with the disposal and also to mitigate the serious deficit of organic matter suffered by many agricultural soils, caused by the low use of organic materials in the fertilization programmes of crops. Present work was therefore, carried out to study the efficiency of composted HPSW as a source of nutrients for vegetative growth and nutritional composition of okra.

II. MATERIALS AND METHODS:

Source material:
Composting of herbal pharmaceutical solid waste was carried out during the month of September-October. Prepared compost feed having 26 C: N was piled up in the form of windrow on outdoor unpaved ground and exposed to temperatures between 40-45°C for 08 weeks. After completion of composting process composted mass was thereafter left for a week to mature. 2 in1 organic compost (commercial name) and inorganic NPK purchase from the local market.

Field trail experiment:
Experiments were conducted during March 2011 to September 2011 at PCSIR Laboratories complex Karachi. Temperatures average between 35 °C-40°C. The soil was sandy loam in texture.

Treatments comprising of HPSW organic compost applied at 25, 37.5 and 50 kg Nha⁻¹ were compared with commercially available compost applied at 50 kg Nha⁻¹, NPK applied at 50 kg

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N\textsuperscript{ha}\textsuperscript{1} and control (without any amendment). All the treatments were replicated three times in a randomized complete block design. Each amendment was applied only one time into the soil one week before sowing. All amendments were uniformly mixed with the surface soil (0-15 cm). Okra seeds were planted at 0.25 m within rows and 0.5 m between rows. Total mean yield from each treatment was determined by harvesting all the okra pods in the three replicate plots. Weeding and sprays against insects and pests were done uniformly in all treatments. At maturity, data regarding plant height, fresh pod yield g plant\textsuperscript{-1}, number of pods plant\textsuperscript{-1} and nutritional value of freshly harvested pods were recorded.

**Chemical Analysis:**

Soil was analyzed for texture, electrical conductivity, pH and organic matter by using standard methods AOAC (2005).

Freshly harvested, matured okra pods were analyzed for moisture, fat, protein and ash content according to standard methods AOAC (2005). Total moisture was determined in an oven at 65 °C till constant dry weight while ash content was determined through combustion in a muffle furnace at 550°C for 6 h, total Kjeldahl nitrogen was determined by Kjeldahl method. Fat content was estimated by petroleum ether extraction. Calorific value of the powdered okra pods was determined on Ballistic Bomb Calorimeter (Gallenkamp).

**Determination of minerals:**

For the estimation of mineral composition, dried and powdered okra pods were digested with concentrated nitric acid and hydrochloric acid and then determined by using atomic absorption spectrophotometer AAS, Z-8000 Hitachi AOAC(2005)

**Determination of Vitamin B complex:**

Vitamins were extracted from okra pods by using 0.1 N HCl. After extraction samples were digested in a boiling water bath for 30 min. followed by pH adjustment up to 4.0-4.5 using 2.5 M sodium acetate buffer, 10% enzyme solution (Takka diastase) was then added and incubated for 3 h at 45°C -50°C. The preparations were cooled, filtered and diluted with distilled water. Finally prepared aliquots were analyzed by HPLC (Agilent 1100) equipped with Zorbax SB-C8, 4.6 x150mm, 5nm column.

### III. RESULTS AND DISCUSSION:

Okra plant height was significantly affected by all applied amendments. Mean values for plant height under composted HPSW @ 25, 37.5, 50 kg N ha\textsuperscript{-1}, NPK @ 50 kg N ha\textsuperscript{-1}, 2 in one compost @ 50 kg ha\textsuperscript{-1} and control were 82.37, 91.89, 143.66, 146.29, 92.93, 122.74 and 82.37 cm, respectively. Data revealed that okra plant height significantly increased by all treatments with respect to control although, plants treated with 2 in one compost and NPK at 50 kgN\textsuperscript{ha}\textsuperscript{-1} also showed better output but it is evident that the plants from plots treated with composted HPSW at 37.5 and 50 kgN ha\textsuperscript{-1} showed maximum plant heights which are 77.24 % and 74.40 % greater as compared to control. Oshunsanya, 2010 suggested that increase or decrease in plant height depends upon soil water holding capacity, soil aggregation and bulk density so; the prominent increase in the plant heights reflects the ameliorative effect of the composted HPSW on the properties of the soil. If we compare mean plant heights obtained by the application of three different dose of composted HPSW it can be seen that increase in dose quantity also bring about increase in plant height. This account for highest plant height on plots that treated with 50 kgN\textsuperscript{ha}\textsuperscript{-1} composted HPSW might be due to increased reduction in bulk density of soil and ability to mineralize gradually.

Similarly, higher fresh pod yields were recorded again in the plots that received composted HPSW @ 37.5 and 50 kgN\textsuperscript{ha}\textsuperscript{-1} which are respectively 22 and 25 % higher with compared to control. Similarly composted HPSW @ 25kgN\textsuperscript{ha}\textsuperscript{-1}, NPK @50kgN\textsuperscript{ha}\textsuperscript{-1} and 2 in one compost give 13, 15 and 19 % increased yield with respect to control. The same trend was observed in case of number of pods plant\textsuperscript{-1} as maximum number of pods i.e. 21 and 18 was observed in plots that received composted HPSW @ 37.5 and 50 kgN\textsuperscript{ha}\textsuperscript{-1}. It was also noticed that yields increase with increasing rates of composted HPSW.

Results of proximate analysis of okra pods harvested from different treatments including control are mentioned in table 2. In case of moisture content of okra pods harvested from all treatments including control a non- significant difference was observed and values were found in the range 87.69 %\textendash 90.31% which is within the standard range Ikekoronye and Ngoddy (1985). Results of % fat, % protein, % mineral content and energy value also showed no marked differences within the treatments and control.

Results achieved for vitamin B complex concentration determined in okra pods harvested from all treatments showed increase in the level of B complex content with respect to control. Higher concentrations of B complex series were found in okra pods harvested from plots that received 50 kg N\textsuperscript{ha}\textsuperscript{-1}, i.e. concentration of folic acid 65 µg / 100g, pyridoxine 0.23 mg / 100g, niacin 2.1 mg / 100g, riboflavin 0.13 mg / 100g and thiamine 0.19 mg / 100g. If we compare obtained values for B complex in okra pods harvested from all applied treatments with the standard values recommended by USDA we found out that excluding values obtained by pods harvested from plots treated with 50 kg N\textsuperscript{ha}\textsuperscript{-1}, all other treatments showed values lower than the standard values.

Mineral analysis of the okra pods harvested from different treatments showed highest concentration level of Ca, Na and Zn was revealed in pods harvested from plots that received 50 kg N\textsuperscript{ha}\textsuperscript{-1}, while the concentration of Mg and Fe was highest in pods harvested from plots treated with 37.5 kg N\textsuperscript{ha}\textsuperscript{-1}. The remaining minerals like Mn and Cu showed no significant variation among all treatments including control.

### IV. CONCLUSION:

On the basis of achieved Findings it can be concluded that the use of composted HPSW as a source of plant nutrient may be a suitable option and have potential to reduce dependence on chemical fertilizers. In addition, okra pods harvested from the composted HPSW treated okra plants have fairly good content of nutrients and were envisaged as a good source of minerals, proteins, fats and energy value.
REFERENCES


AUTHORS

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Table-1: Effect of different treatments on the growth and yield of okra.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plant Height (cm)</td>
</tr>
<tr>
<td>Control</td>
<td>82.37±16.52</td>
</tr>
<tr>
<td>HPSW Compost</td>
<td>91.89±29.88</td>
</tr>
<tr>
<td>HPSW Compost (37.5 Kg N ha&lt;sup&gt;-1&lt;/sup&gt;)</td>
<td>143.66±46.99</td>
</tr>
<tr>
<td>HPSW Compost (50 Kg N ha&lt;sup&gt;-1&lt;/sup&gt;)</td>
<td>146.29±12.60</td>
</tr>
<tr>
<td>2 in one Compost (50 Kg N ha&lt;sup&gt;-1&lt;/sup&gt;)</td>
<td>122.74±61.47</td>
</tr>
<tr>
<td>NPK</td>
<td>92.93±42.46</td>
</tr>
</tbody>
</table>

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Table-2: Effect of different treatments on proximate analysis of okra pods.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Control</th>
<th>HPSW Compost (25 Kg Nha⁻¹)</th>
<th>HPSW Compost (37.5 Kg Nha⁻¹)</th>
<th>HPSW Compost (50 Kg Nha⁻¹)</th>
<th>2 in one Compost (50 Kg Nha⁻¹)</th>
<th>NPK (50Kg Nha⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture %</td>
<td>88.20±1.5</td>
<td>88.40±3.50</td>
<td>88.81±1.25</td>
<td>88.85±3.1</td>
<td>89.52±4.23</td>
<td>90.31±1.19</td>
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<tr>
<td>Fat %</td>
<td>2.11±0.50</td>
<td>2.27±1.06</td>
<td>2.31±0.50</td>
<td>2.35±0.12</td>
<td>2.38±1.16</td>
<td>2.68±0.25</td>
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<tr>
<td>Protein %</td>
<td>14.52±3.25</td>
<td>15.58±3.55</td>
<td>16.20±1.25</td>
<td>17.96±3.6</td>
<td>14.33±1.97</td>
<td>16.29±2.21</td>
</tr>
<tr>
<td>Calorific Value Kcal / 100g</td>
<td>1825</td>
<td>1879</td>
<td>1923</td>
<td>1980</td>
<td>1825</td>
<td>1850</td>
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<tr>
<td>Mineral Content %</td>
<td>9.23±1.47</td>
<td>9.41±0.95</td>
<td>9.56±1.25</td>
<td>9.99±1.22</td>
<td>9.63±1.52</td>
<td>10.36±0.95</td>
</tr>
</tbody>
</table>
Fig-1: Comparative effect of different treatments on vitamin B complex content of okra pods.
Fig-2: Comparative effect of different treatments on mineral content of okra pods.

<table>
<thead>
<tr>
<th></th>
<th>Ca</th>
<th>Mg</th>
<th>Na</th>
<th>Cu</th>
<th>Mn</th>
<th>Fe</th>
<th>Zn</th>
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</thead>
<tbody>
<tr>
<td>Composted HPSW @50KgNha-1</td>
<td>606</td>
<td>37.31</td>
<td>62.87</td>
<td>1.02</td>
<td>1.69</td>
<td>12.71</td>
<td>5.82</td>
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<tr>
<td>Composted HPSW @37.5KgNha-1</td>
<td>544</td>
<td>45.62</td>
<td>52.24</td>
<td>1.06</td>
<td>2.05</td>
<td>13.74</td>
<td>5.83</td>
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<tr>
<td>Composted HPSW @25KgNha-1</td>
<td>533</td>
<td>39.57</td>
<td>49.79</td>
<td>1.18</td>
<td>2.1</td>
<td>11.32</td>
<td>5.16</td>
</tr>
<tr>
<td>NPK @50Kgha-1</td>
<td>497</td>
<td>37.13</td>
<td>49.75</td>
<td>0.92</td>
<td>1.83</td>
<td>10.02</td>
<td>4.48</td>
</tr>
<tr>
<td>2 IN one compost @50KgNha-1</td>
<td>509</td>
<td>28.33</td>
<td>48.55</td>
<td>0.96</td>
<td>1.85</td>
<td>11.3</td>
<td>4.93</td>
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<tr>
<td>control</td>
<td>488</td>
<td>32.89</td>
<td>42.23</td>
<td>1.11</td>
<td>2.11</td>
<td>12.56</td>
<td>5.78</td>
</tr>
</tbody>
</table>
Soil Degradation and Conservation Practices: the case of Darimu and Chewaka woredas, Illu Ababora Zone, Ethiopia

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Abstract- This study was aimed to assess soil degradation and conservation practices in Darimu and Chewaka Woredas of Illu Ababora Zone. Through purposive and simple random sampling methods a total of 331 respondents were selected from the woredas. To achieve the objectives of the study both qualitative and quantitative methods of data analysis were used. Descriptive statistics such as percentage distribution, bar graphs, charts, tables were used and more of qualitative analysis was used. According to the major findings of the study, the major factors that exposed the area for soil erosion was topography, land use/cover change, continuous farming without fallowing, population pressure, attitude and perception of farmers, knowledge and use of soil conservation practices. The survey result reveals that there are various indigenous and adopted soil conservation practices in the area. Among these, fallowing, manure, contour plowing, crop rotation, waterways are indigenous soil conservation practices and terracing, soil bund, fogn juu, grass strip, chomo grass and elephant grass are some of the adopted soil conservation practices. The result of the study also reveals that the major challenges of adopting structural soil conservation mechanisms in the area includes; geographical aspect, land tenure, educational level, farmer access to extension services, sex of the household, awareness of farmers about soil conservation methods and off farm activities. Finally, suggestions have been forwarded based on the findings of the study.

Index Terms- Indigenous Conservation, Soil Erosion, Structural Conservation,

I. INTRODUCTION

Background of the study

The natural environment consists of various valuable natural resources such as air, water, soil, land, forest, flora and fauna which are basic for human life and development. Any change brought about in one of these components is counter balanced by some other changes in another component of the environment (Agele et al, 2000). In order to withstand such changes a wide range of techniques of natural resources management (NRM) have been used. Nonetheless, degradation of soils and other natural resources proceeds at a high rate in much of Africa, reflecting low rates of adoption of sustainable NRM strategies, especially among the poorer subpopulation of smallholder producers (Kassie et al., 2008).

Soil is the most important natural resource all over the world. It is a place from which human beings are exploiting a number of crops (Taffa, 2002). Soil which is an integrated part of vegetation is the immediate focus of most local, regional, and international protocols, and conferences that are meant to pave the way to sustainable development. Farmlands are the components and homelands of the basic natural resources of the globe and in which the various ecosystems interact with their environment. Thus, soil resource management significantly determines the sustainability of NRM, and agricultural practices and productivities of a country, mainly where agriculture is the leading economic activity like in Africa in general and Ethiopia in particular.

The soil is the soul of a farm. Proper soil management will maximize forage and crop production. However, this precious resource, mainly in the developing world, has been deteriorated and lost in an alarming rate as a result of poor management practices (Yohanis, 1989). In Ethiopia soil resource degradation has become a serious problem affecting all spheres of social, economic and political life of the population. It is one of the major challenges to agricultural development and food security of the country. Such problem is also common in the case of Darimu and Chewaka woredas’ which are one of the victims of the problem. In light of this, it is important to assess practices and aspects of adopting structural soil conservation techniques in Darimu and Chewaka district.

1.2. Statement of the Problem

Soil is an important resource, which needs much attention in its use and management. It is the soil which nourishes and provides with required needs for the whole of nature. In Ethiopia soil conservation has been carried out with limited success. There is less-willingness to accept and maintain the extensively introduced practices of soil conservation. Besides, soil erosion is a major contributor to the prevailing food insecurity of Ethiopia. Thus, soil conservation is vital to the achievement of food security, poverty reduction and environmental sustainability in the country (Woldeamlak, 2007). Soil resource degradation is one of the major challenges in agricultural production in many parts of the world, especially in developing nations, such as Ethiopia in general and Darimu and Chewaka woreda in particular.

Darimu and Chewaka are one of the 180 woredas in Oromia Region of Ethiopia. A large part of the woredas’ land is exposed to severe soil erosion, land fragmentation, deforestation and land pressure. As a result, the soil becomes unable to satisfy the rapidly growing demands of population. The district has been exploited and degraded continuously. As a result, majority of rural inhabitants are suffering from food insecurity. This is
mainly because of that the soil is incapable to support cultivation caused by soil erosion and its related problems. In the area, erosion problems and measures to tackle were rarely investigated. Although structural soil conservation methods are widely represented as having significant environmental, economic, social and political benefits for both individual landholders and the wider community, adoption of such measures is commonly perceived to be slow. Consequently, severe erosion continues to affect the farmers’ livelihoods. The rich top-soils have been washed off by runoff and the remaining sub-soils are exposed and generally deficient in available minerals. The study areas are characterized by steep and undulating terrain and susceptible to soil erosion. The area also receives heavy rain, which is concentrated in few months of the year. Hence, the main objective of the study was to assess soil degradation and conservation practices in Darimu and Chewaka Woredas of Illu Ababora Zone.

II. MATERIALS AND METHODS

1.1. Study Area description
The study was conducted in Oromia Regional state, Illu Abba Bora zone, in Darimu and Chewaka woredas. Specifically, the study was carried out in the ten selected rural kebeles of the Darimu and Chewaka woredas (i.e 5 kebeles from Each Woreda). Chewaka and Darimu woreda is located in the south western of Oromia regional state, Illu Ababora Zone. Chweaka is located 190 kms from zonal town (Mettu town).

1.2. Research Design
The particular research design employed for this study will be descriptive type of study utilizing survey method. This is because the study requires description of how the response of households looks like in light of contemporary environmental problems.

1.3. Sample Size and Sampling Techniques
In this study, two types of sampling techniques were employed. These were purposive and stratified random sampling methods. Darimu and Chewaka woreda were purposefully selected as a research setting due to the fact that there are severe soil resource degradation problems in the districts, especially in the ten kebeles of the Woredas. In addition to this, in the area, research works are very little and there are no studies done so far on such issues in the area. Consequently, the study was partially intended to fill this gap. Pursasive selection of the topic is due the fact that in order to ensure sustainable soil resource conservation in the woreda, assessing such issue is important from development perspectives.

In order to obtain the sampling units or respondents the researchers’ employed stratified simple random sampling method. Because it was believed that this method would not affect the representation of the samples as Head of households represent from each kebeles and this method gives equal chance of being selected for each households. Head of Households will be stratified according to their goti to conduct the survey in the area. All in total 331 of the total Household heads/respondents of the total head of the households will be randomly selected by applying proportional sample allocation method from the “gotis.” The sample size in each stratum is proportional to the size of stratum. This was determined by the following formula:

$nh = \left( \frac{Nh}{N} \right) \times n$

where,

$nh = $ Sample size of the stratum

$Nh = $ Total population of the stratum

$N = $ Total population (i.e. total HHs)

$n= $ Total sample size

Source: (Kothari, 2004)

1.4. Data Sources and collection instruments
In order to get reliable and valid data so as to achieve the objectives of the study, the researchers collected data from both
primary and secondary sources. The primary data were collected through household survey questionnaire, interview, field observation and Focus Group Discussion (FGD). To supplement the primary data, secondary sources of data were collected from various documents, books, journals, reports, electronic media (internet), etc. To collect primary data for the study, the researchers used above mentioned data collection instruments for their own advantage one over the other and for the purpose of their complementarities.

1.5. Method of data Analysis

The data collected via various methods of data collection instruments were analyzed, summarized, and presented through qualitative and quantitative methods. The data collected through questionnaire were quantitatively tabulated, interpreted and presented by using certain Statistical methods such as percentages and mean; the analysis will be made by using SPSS version 20 and Ms Excel. Besides, the data collected through interview, personal observations and focus group discussion were analyzed qualitatively. In addition to this, maps, figures, pie chart, and cross tabulations were used.

III. RESULT AND DISCUSSION

1.6. Soil Degradation in the study area

There are different indicators that verifies the existence of sever soil erosion in the area which is indicated by the farmers, DAs and also the researchers personal observation. The development of rills and gullies and removal of fertile top soil are the major indicators of existence of prevalent soil erosion in the area and the researchers also verified though observation. As indicated in figure 2 below there are differences on the perception of farmers on the indicators of existence of soil erosion on their farms. The variation on the expression of indicators of erosion was the result of the difference on the intensity and degree of erosion on their farmlands. Those farmers who choose the severity level as high understood and related the existence of soil erosion on their plots to loss of topsoil and development of gullies and rills in their farms. Hence, 85.4% and 87.8% of the farmers suggested that, absence of fertile topsoil and rills and gully development, respectively to be the major indicators of the existence of moderate to severe soil erosion problem on their cultivated fields. 63.1% of the farmers explained the occurrence of soil erosion in the study area in general and their farms by the presence of accumulated soil at the bottom of conservation structures and lower positions. Some sample respondents use the color of soil (32.5%), Steepness of slop (52.5%), stoniness of soil (42%), root exposure (9.5%) and poor crop and grass growth (63.5 %) as indicators of erosion occurrence.

![Figure 2: Indicators of erosion in the study area](https://via.placeholder.com/150)

Source: Field survey, 2015

1.7. Major Causes of soil degradation in Darimu and Chewaka woreda

The major causes of soil erosion mentioned by farmers included erosive rains (existence of intensive rain fall), steep slope (topography), and little use of soil conservation practices, damaged conservation structures, and tillage, which makes the soil loose and bare. Rainfall leads to significant soil loss mainly at times of seedbed preparation. Over half of the farm plots managed by the total respondents were located on slopes having more than a 10% gradient. Farmers also recognized the effects of slope on soil erosion. Yet, few respondents indicated that damaged conservation structures escalated the problem. Farmers’ did not refer to crop types when mentioning the causes of soil erosion. The result in this study also confirms that soil degradation by water is the major challenge for agricultural land/soil/ degradation. The result from focus group discussion about the major land degradation is that sometimes unexpected intensive rain comes and washes the top fertile and prepared agricultural land for cultivation.

Even though, type of erosion which exerts influence on soil erosion is caused by water /rainfall/, there are different root causes that makes the land in general and agricultural land in
particular more vulnerable for erosion and low productivity. The major causes identified by farmers, DA and woreda agricultural office workers of the Chewaqa and Darimu woredas are the following:

- Population pressure
- Topography/slope of the area
- Farmers’ perception and attitude
- Land Use/Cover Dynamics
- Knowledge and use of conservation techniques
- Intensive cultivation and absence of fallowing

Now a day’s indigenous knowledge (indigenous soil and water conservation practices which is created by the local community) are getting high attention in soil and water conservation. However, different adopted technologies to conserve soil and water is also playing greater role in addition to the indigenous. Thus the survey result indicates that, the study area farmers are using different types of indigenous and adopted soil and water conservation practices.

Several traditional soil fertility maintenance techniques have been identified in the area. These include “Kosii fi dike naqqu (manuring), Lafa baasu (fallowing) and Bo’oo baasu (traditional water way). In the past since farmers used to have a large number of cattle and area of land, Kosii fi dike naqqu, (manuring) and Lafa baasu (fallowing) were the major practices for soil fertility maintenance in the area under study.

Traditional soil conservation techniques are better practiced in the study area as compared to the adopted modern technologies in both study woredas. As the survey result indicates that the reason behind is farmers previeced that they are free from any dis advantage and they do have positive attitude for them. As the same time they perceived that it is more practical and they can construct in the way that they precieved is better. Specifically the survey result reveals contour plowing (96.2% in Darimu and 91.4% in Chewaka), crop rotation (79.2% in Darimu and 87.7% in Chewaka) and water way (82.3% in Darimu and 76.6% in Chewaka) have been better practiced by the local community in the study area.

1.8. Indigenous and Adopted Method of Soil Conservation in the study Area

Figure 3: traditional soil conservation methods

- Bo’oo baasu: (Traditional water way and ditches): This structure is constructed mainly by oxen drawn plough, but depending on the runoff expected, which depends on the slope length and gradient, intensity of rainfall and the type of crop planted upstream of the field, reinforcement by hoeing may be necessary. This conservation measure is constructed alongside the farm plots for the safe disposal of runoff.

- Lafa baasu (Fallowing): It is a practice of abandoning land for upgrading when the nutrients are exhausted. Fallow land is commonly used as a grazing ground for five to seven years depending on land holding of the farmer and the nature of the land to recover. However,
due to population pressure, which resulted in reduced land holding and hence limited grazing ground, leaving a land fallow have gradually become difficult.

- **Kosii fi dikee itti naquu (Manuring):** It is a practice of spreading households’ wastes to the field for soil fertility maintenance. ‘Kosii, which literally means waste, consists of all kinds of human and livestock residues in and around the residence. This practice undertake mainly in those household that have many livestock.

- **Lafa irran gadee dalga qotuu/Contour Plowing/:** Contour plowing is intensively applied in both study woredas by many of the farmers (i.e. 98.46%). These farmers have stated that contour plowing is practiced to minimize the energetic downward flow of floods and facilitates rain water percolation.

- **Crop rotation;** this is planting of a series of different crops in the same field over a period of time alternatively, so that the soil fertility is maintained. In the study area, 97.69% of the respondents agree that they apply crop rotation on their farmlands. Cereal crops are grown at a given farm plot after two or more years of production leaving the preceding and succeeding production seasons for other crops so as to enable the soil to replenish and restore fertilizing nutrients taken up by the produced crops during the preceding production season(s).

- **Drainage ditches:** The drainage ditches are one of the most widely used SWC practices in the watershed area. They are transitory water channels used to drain off excess water from the cultivated fields. The drainage ditches are low-cost measures in which their construction is part of the normal ploughing activity.

On the other hand, there are various adopted soil conservation technologies in the area.

As it indicated in the figure above the adoption of new/modern soil conservation practices are in a very low stage. Only some of the techniques are practiced better by some farmers like terracing (55 % in Darimu and 36.3 % in Chewaka), cut off drains (73.5 % in Darimu and 82.4 % in Chewaka), grass strip (vetivar grass) (76.5 % in Darimu and 57.7 % in Chewaka) and some others are little practiced like soil bund, compost agroforestry and others.

**Soil bund and Stone bund:** soil bund is an embankment constructed from soil along the contour with water collection channel or basin at its upper side. It is constructed by throwing soil dug from basin down slope. It is used to control runoff and erosion from cultivation fields by reducing the slope length of the field which ultimately reduces and stops velocity of runoff. Usually it is constructed in fields that have slope greater 10%. Figure above shows that (34.4% in Darimu and 46.3 % in Chewaka) adopted the structure on their farm plot.

![Figure 5: Soil bund: photo by researchers, 2015](image-url)
The soil bunds are made of soil or mud. On moderately sloping areas, the farmers construct the soil bunds for erosion control. **Fanya juu:** (a Swahili term meaning “to throw up”) is a soil bund type where in a ditch is dug along the contour and the soil is thrown up to form a ridge above; a natural bench terrace will subsequently form over the next few years. They are usually constructed in the fields sloping above 10%. The survey result shows that about 87.7% adopted fanya juu on their farm plot. Even though, it is an important method of soil conservation, its adoption and practice in the study area is very low only 32.7% in Darimu woreda and 21.5% in Chewaka woredas. Therefore, more efforts should be done to increase its adoption and conserve the soil better.

**Grass strip:** Grass strip helps to reduce run off and filter out sediments carried by runoff and stabilize fanya juu and soil bund in farm plot. If grass strips grow, it will effectively build up into terrace and provide cattle fodder. An important type of grass strip method practiced in area is the vetivar grass technology. Unlike any other modern soil conservation methods vetivar grasses are more visible the majorities of the farmers plot.

**Figure 6: Grass trip (vetivar grass): photo by researchers, 2015**

**Cut off drain and Water way:** They are channels used to collect run off from the land above and to divert it safely to a water way or river; thus protecting the land below from excessive erosion. This structure is adopted by the majority of farmers 96.2% of farmers this could be due to the structure is ease to construct and applied to all cultivated land.

**Terracing:** It is also among the better adopted soil conservation techniques in the study area. However, farmers stated different challenges related to the practice and implementation of terracing on their plot.

In addition, there are also different types of soil conservation mechanisms in the study area, even though the practice and adoption is insignificant. Some of them are composting, chomo grass, elephant grass, agroforestry etc.

### 1.9. Factors Affecting Adoption of Soil Conservation techniques in the area

Adoption and implementation of structural soil conservation techniques could possibly be influenced by different factors (Akilu, 2006). Some influence practice of structural measures negatively whereas other factors affect the practice positively. In the study area the following factors that influence adoption and implementations of soil conservation techniques are identified in this research.

- Slope of the area or Geographical aspect of the area
- Land tenure status of the farmers
- Educational attainment or Education Level of the farmers
- Access to Extension services and Other Natural resource Expertise
- Gender or sex of the households
- Size of land/ farm land holding size of the farmers’
- Off farm activities /income

### IV. Conclusion

Soil erosion is one of major threat to the agricultural economic development of Ethiopia. Soil erosion contributes to the prevailing of food insecurity in a country. It is sever in the high lands and land cover is low in Ethiopia where largest portion of population mainly dependent on agricultural production. There are different factors that cause such an alarming increase in the soil erosion and loss of agricultural productivity in the area. As the survey result indicates the major factors for the occurrence and increment of erosion in the area are: Population pressure, Topography/slope of the area, Farmers’ perception and attitude, Land Use/Cover Dynamics, Knowledge and use of conservation techniques, Intensive cultivation and absence of fallowing.

As a result, a range of conservation measures were introduced with the objective of conserving, developing and rehabilitating degraded agricultural lands and increasing food security through crop production with the cooperation of Zonal and Woreda agricultural and rural development office. Farmers in the study area were using different indigenous and adopted soil conservation technologies. Even though, they used indigenous and adopted soil conservation methods, farmers are more dependent on traditional or indigenous soil conservation methods. Some of the indigenous soil conservation methods are Bo’oo baasu: (Traditional water way and ditches), Lafa baasu (Fallowing), Kosii fi dikee itti naquu (Manuring), and Lafa irrangadee dalga qotuu/Contour Plowing /, Crop rotation, and Drainage ditches.

Adoption and implementation of structural soil conservation techniques could possibly be influenced by different factors such as: Slope, Land tenure status, Educational attainment or Education Level of the farmers, Farmers’ Access to Extension services, sex of the households, farm land holding size of the farmers’ Off farm activities /income.

### V. Recommendation

Based on the findings of the study the following recommendations are forwarded for the betterment of the soil conservation method in the area:

- Creating awareness on the farmers about soil erosion, conservation and its importance for soil fertility and productivity through the cooperation of the DAs, woreda and zonal agricultural and natural resources.

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management office and other stockholders should be delivered. Farmers in the area use indigenous soil conservation mechanisms more than the adopted and since they are traditional farmers by themselves are constructing the structure without any advice and it affects the farm land and the young crops like water ways. This implies that information about ineffectiveness of traditional conservation measures has to be disseminated mainly for farmers that heavily rely on traditional conservation measures. It should also be made part and parcel of training programs. Especially, FTCs should focus on merits and demerits of traditional conservation structures when they teach about soil conservation. The major and recent challenge for the occurrence of soil erosion in the area was the conversion of vegetation land to agricultural land or forest degradation. Thus, the government and other stakeholders should work to minimize forest degradation and to create some off farm activities.

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The Effectiveness of Oral Pregabalin in Attenuation of Systolic Blood Pressure and Heart rate due to airway instrumentation During General Anaesthesia. A Dose Response Study

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Abstract-Introduction: Oral pregabalin premedication adequately sedates the patient and haemodynamic pressor response of airway instrumentation was attenuated Material and methods: The study was designed as a prospective randomized, double-blinded, placebo controlled study, which included 120 normotensive adult patients aged 24-56 years of both genders scheduled for elective surgery under general anaesthesia with ASA physical status I & II were allocated for the study. This study was done in the department of anaesthesia, and critical care, Sher-i-Kashmir institute of medical science, Srinagar (J & K) after obtaining approval from ethical committee, a written informed consent was taken from the patients for participation in this study. Results: Systolic blood pressure increased maximally in group I (P0) and group II (P75) 1 min after direct laryngoscopy and endotracheal intubation from baseline (32.1% from baseline). It gradually decreased to near baseline values over 10 minutes. In group III (P150) maximum rise in blood pressure was 11.1% from baseline. Among these only pregabalin 150 mg attenuated the rise in blood pressure following laryngoscopy (p-value=0.001).

There was no significant difference in heart rate among groups before and after premedication. Immediately after laryngoscopy and intubation, the heart rate increased significantly in all groups, increase was least in group III. Maximum increase in heart rate from baseline was observed after 1 min of laryngoscopy.

Conclusion: There was no statistically significant difference between placebo and pregabalin 75 mg in attenuation of systolic blood pressure.

No statistically significant attenuation of heart rate was observed in the premedicated group, although it remained stabilised in group III as compared with group I and II.

Index Terms- Haemodynamic pressure response, oral pregabalin, gabapentin.

I. INTRODUCTION

Laryngoscopy and endotracheal intubation are the fundamental components of airway management and facilitate maximum control of ventilation and oxygenation, and form an integral part of anaesthesiologist’s contribution to patient care. However, laryngoscopy is a noxious and most invasive stimulus during endotracheal intubation.1,2 Manipulation of the upper respiratory tract such as during laryngoscopy and endotracheal intubation are associated with haemodynamic and cardiovascular responses consisting of increased circulating catecholamine, heart rate, blood pressure, myocardial oxygen demand, tachycardia and dysrhythmias.3 The majority of these stimuli arise from stimulation of supraglottic region by tissue tension induced by laryngoscopy. Placement of endotracheal tube and inflation of the cuff in the subglottic region produces a smaller additional response. Most anaesthesiologists agree that a skilled anaesthesiologist applies only a small force to the patient’s larynx when using a laryngoscope and that reducing the force on larynx might prevent haemodynamic responses to endotracheal intubation.2,4-7

Evidence from the laboratory data demonstrates that epipharyngeal and laryngopharyngeal stimulation augments cervical sympathetic activity in the efferent fibers to heart. This explains the increase in plasma levels of nor-epinephrine and to a lesser extent epinephrine which occur in response to laryngoscopy and endotracheal intubation.6 The cardiovascular response to noxious airway manipulation are initiated by proprioceptors responding to tissue irritation in supraglottic region and trachea. These proprioceptors consist of mechano-receptors with small diameter myelinated fibers. The glosso-pharyngeal and vagal afferent nerves transmit these impulses to the brain stem, which in turn causes widespread autonomic activation throughout both sympathetic and parasympathetic nervous systems.

The rise in heart rate and blood pressure is usually transient occurring 30 seconds after intubation and lasting for less than 10 minutes.4 Usually these changes are well tolerated by healthy individuals, but are of great concern in susceptible individuals particularly those with systemic hypertension, coronary artery disease, leaking abdominal aneurysm, intracranial aneurysm and recent myocardial infarction. In such patients these transient changes can result in potentially deleterious effects such as myocardial ischemia, left ventricular failure as a result of increased myocardial oxygen demand and cerebral haemorrhage.1,8
Control and protection of airway during general anaesthesia has been fundamental subject under consideration for the past four decades.

Many studies have therefore concentrated on the stressful stimulus of laryngoscopy and endotracheal intubation and a number of pharmacological measures have been used to attenuate the haemodynamic stress response to laryngoscopy and endotracheal intubation. No single drug or technique is completely satisfactory. These measures are:

- Inhalational anaesthetic agents are used to obtund the laryngoscopic response by increasing the depth of anaesthesia. However it leads to hypotension, bradycardia and myocardial ischemia. In hypertensive patients.
- Alpha adrenergic blocker, phentolamine was used to attenuate the laryngoscopic response. Beta adrenergic blocking drugs are being used for blunting hemodynamic responses.
- Directly acting vasodilators like sodium nitroprusside and nitroglycerine.
- Low dose opioids like morphine and fentanyl.
- Topical administration of local anaesthetics like lignocaine which block the sensory fibres in laryngopharynx.
- Calcium channel blockers like nicardipine, verapamil and diltiazem.
- Clonidine and other α2-adrenoceptor agonists are under intense investigation.
- Gabapentin was introduced as an anti-epileptic drug in 1993. Many studies are going on to prove the efficacy of gabapentin in attenuating preoperative anxiety and stress response to intubation.
- Oral pregabalin premedication adequately sedates the patient and haemodynamic pressor response of airway instrumentation was attenuated in dose-related fashion.

The present study was performed to compare the effect of oral Pregabalin premedication on modifying the hemodynamic stress response following laryngoscopy and intubation.

II. AIMS AND OBJECTIVES

1. To evaluate the safety and efficacy of oral Pregabalin premedication for attenuation of haemodynamic pressor response to airway instrumentation.
2. To compare the effectiveness of oral pregabalin in different doses to attenuate haemodynamic pressor response to airway instrumentation under general anaesthesia.

III. MATERIALS AND METHODS

The study entitled “The Effectiveness of Oral Pregabalin in Attenuation of Systolic Blood Pressure and Heart rate due to airway instrumentation during General Anaesthesia: A dose response study” was conducted in department of anaesthesia and critical care, Srinagar (Kashmir) after obtaining approval from ethical committee, a written informed consent was taken from the patients for participation in this study.

The study was designed as a prospective randomized, double-blinded, placebo controlled study, which included 120 normotensive adult patients aged 24-56 years of both genders, scheduled for elective surgery under general anaesthesia with ASA physical status I & II were allocated for the study. The study was carried from January 2013 to November 2014.

IV. EXCLUSION CRITERIA:

Patients with anticipated difficult intubation, history of cardiac, pulmonary or renal disease, obesity, allergy to any anaesthetic medication and patients on sedatives, hypnotics or antihypertensive medication were excluded. When duration of laryngoscopy exceeding 22s or a second attempt for intubation is needed these patients were also excluded from the study.

The patients were randomly allocated into three groups of forty patients each. Patients selected for surgery were admitted 24 hrs prior to surgery. Preanaesthetic evaluation was done at this stage. Age, gender, weight, ASA physical status was noted in all patients. A thorough history of any comorbid disease, previous anaesthetic exposure, smoking, medications, allergy to any drugs and personal habits was elicited.

Double blinding was done by means of sealed envelope technique using forty similar looking thick opaque envelopes and the code name I, II, or III was mentioned on top of envelope. The assistant separated the capsules of placebo, capsules of pregabalin (75mg) and capsules of pregabalin (150mg) into three equal groups of forty each. Thus three groups of forty envelopes were prepared containing either capsules of placebo, capsules of pregabalin 75 mg or capsules of pregabalin 150mg with the same code (I or II or III) mentioned on them. Only the assistant was aware of the code identity which was revealed at the end of study.

The patients were randomly allocated to three equal groups of forty each.

Group I (Po): Forty patients received oral placebo (po) in the form of oral multivitamin capsules 1 hr before surgery. (labeled code I)

Group II (P75): Forty patients received pregabalin 75mg orally with sip of water 1 hr before surgery. (labeled code II)

Group 3 (P150): Forty patients received pregabalin 150mg orally with sip of water 1 hr before surgery. (labeled code III)

The drug from the closed envelope was drawn and given to the patient by anaesthesia technician with sip of water 60 minutes before induction of anaesthesia. The identity of the capsule was not revealed to the patient. The patients did not receive any other premedication other than the study drugs mentioned.

Continuous monitoring of heart rate, blood pressure (systolic in mmHg), SpO2 (pulse oximetry) and EtCO2 was done using WATO EX-65 monitor.

Baseline readings of heart rate (HR), systolic blood pressure (SBP), before induction of anaesthesia.

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The study parameters i.e. heart rate (HR), systolic blood pressure (SBP) were recorded at following intervals:
1. Baseline.
2. Before induction.
3. After induction.
4. One minute after intubation i.e. T1
5. Five minutes after intubation i.e. T5
6. Ten minutes after intubation i.e. T10

The analysis of data was carried out by statistical package for social sciences (SPSS version 14.0) U.S.A, Chicago for windows.

V. OBSERVATIONS & RESULTS

120 patients undergoing elective surgery under general anaesthesia with endotracheal intubation were divided randomly into three groups with 40 patients each

- Group I (P_0): Received placebo 1 hr before surgery.
- Group II (P_75): Received oral pregabalin 75mg orally 1 hr before surgery.
- Group III (P_150): Received oral pregabalin 150mg orally 1 hr before surgery.

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<th>TABLE 1: Comparison of heart rate (beats/min.) in three groups</th>
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In Table 1, there was a non-significant difference in the heart rate values among groups before and after premedication. Immediately after laryngoscopy and intubation, the heart rate increased significantly in all groups, but the increase was least in group III (P_150), which bears a significant difference with group I and group II. The significant difference persists among the groups up to 10 minutes after intubation and even after extubation. The difference among the groups was statistically significant.
In Table 2, there was a non-significant difference in systolic blood pressure at baseline among the three groups. Before induction, a non-significant difference was observed between group I and group II, which persists up to 10 min after intubation while as group III bear a significant difference with group I and group II.

Systolic blood pressure increased maximally in group I (P0) and group II (P75) 1 min after direct laryngoscopy and endotracheal intubation from baseline (32.1% from baseline). In group III (P150) maximum rise in blood pressure was 11.1% from baseline. Among these, only pregabalin 150 mg attenuated the rise in blood pressure following laryngoscopy (p-value = 0.001). There was no statistically significant difference between placebo and pregabalin 75 mg in attenuation of systolic blood pressure.
Discussion

The present study evaluated the safe and clinically effective dose of oral pregabalin premedication for its sedative effects and for attenuation of haemodynamic response of airway instrumentation of direct laryngoscopy and intubation. Although, there are studies regarding pregabalin on controlling the pressor response on laryngoscopy and endotracheal intubation. Our study prospective, randomised, blind, placebo controlled, is a dose response study on pregabalin for attenuation of haemodynamic pressor response due to laryngoscopy and endotracheal intubation.

VI. INTRA-OPERATIVE HAEMODYNAMIC PARAMETER:

VII. HEART RATE (BEATS PER MINUTE):

In group I baseline heart rate was 79.93/min (table 5) which increased to 108.87/min immediately before intubation. The heart rate increased to 121.03/min at 1 min after intubation representing rise of 41.1/min that is 51.42% from baseline. The heart rate started settling down 5 min after intubation. By 5 min it was 111.35 and by 10 min it was 98.65/min. The increase in heart rate from baseline was statistically significant (p-value <0.05) (Table 1, figure 1).

In group II baseline heart rate was 80.08/min (table 5) which increased to 121.03/min at 1 min after intubation representing rise of 41.1/min that is 51.42% from baseline. The heart rate started settling down 5 min after intubation. By 5 min it was 111.35 and by 10 min it was 98.65/min. The increase in heart rate from baseline was statistically significant (p-value <0.05) (Table 1, figure 1).

In group III baseline heart rate was 80.65/min which increased to 90.95/min immediately before intubation. The heart rate increased to 107.05/min at 1 min after intubation representing a rise of 26.4/min that is 32.7% from baseline. Subsequently the heart rate started settling down. By 5 min it was 100.80/min and by 10 min it was 92.50/min which was less compared to group I and II.

In our study, there was no significant difference in heart rate among groups before and after premedication. Immediately after laryngoscopy and intubation, the heart rate increased in all groups, increase was least in group III which bears a significant difference with group I and group II. The significant difference persisted among the groups upto 10 minutes after intubation and even after extubation. The difference among the groups was statistically significant.

On comparing the rise in heart rate in group III with group II and group I, there was a statistically significant difference both after intubation upto 10 minutes and after extubation as well (p-value 0.001).

Our results are in agreement with the study conducted by Rastogi Bhawna et al, they studied a total of 90 normotensive adult patients aged 24-56 years, ASA grade I and II of both gender were randomised into three groups of 30 patients each. Group I received oral placebo, Group II received oral pregabalin 75mg and Group III received oral pregabalin 150mg 1hr prior to induction. Preoperative sedation levels were higher with pregabalin premedication. Significant increase in heart rate and mean arterial pressure was observed in Group I & II after airway instrumentation, while statistically significant attenuation of mean arterial pressure was observed in Group III. No significant decrease in heart rate was observed in any group.

Our results are similar to the study of Namrath et al who did a prospective randomised placebo controlled study in which 90 adult ASA I and II patients undergoing elective surgery of both sexes were divided into three groups. Group A received placebo, Group B received oral gabapentin 800 mg and Group C received pregabalin 150 mg orally. Baseline heart rate, mean
arterial pressure and before induction, after induction, at the time of laryngoscopy and at the end of 0, 1, 3, 5 and 10 min were recorded. Sedation score of all the three groups were recorded. They concluded that pregabalin being more sedative than gabapentin, is better than gabapentin in suppressing the pressor response.

VIII. SYSTOLIC BLOOD PRESSURE IN MMHG:

In group I the baseline systolic blood pressure was 121.20mmHg (table 6). 1 min after intubation it was 160.2mmHg. There was a rise of 39.0mmHg that is 32.1% from baseline. The systolic blood pressure started settling down 5 min after intubation. By 5 min it was 138.10mmHg and by 10 min it was 125.8 mmHg. The increase in systolic blood pressure at 1 min after laryngoscopy and intubation compared to baseline value was statistically significant (p<0.05) (Table 2, figure 2).

In group II, the baseline systolic blood pressure was 119.65 mmHg (table 6). 1 min after intubation it was 158.78 mmHg. There was a rise of 39.13 mmHg that is 32.5% from baseline. This was followed by gradual decline in systolic blood pressure towards baseline. By 5 min it was 137.72 mmHg and by 10 min it was 124.07. There was a statistically significant increase in systolic blood pressure from baseline (p<0.05) (Table 2, figure 2).

In group III, the baseline systolic blood pressure was 120 mmHg (table 6). During pre-induction period there was a fall in systolic blood pressure with mean of 110.6 mmHg. This was not observed in the other two groups. There was rise rather than fall in other two groups during pre-induction period. 1 min after laryngoscopy and intubation, mean systolic blood pressure was 133.38 mmHg representing a rise of 13.38 mmHg that is 11.1% rise from baseline. Subsequently the systolic blood pressure started settling down. By 5 min it was 117.65 and by 10 min it was 108.67 mmHg which is less than the baseline value. The decrease in systolic blood pressure in group III was statistically significant which was not seen in group I and group II (Table 2, figure 2).

There was a non-significant difference in systolic blood pressure at baseline among the three groups. Before induction a non significant difference was observed between group I and group II, which persists up to 10 min after intubation while as group III bear a significant difference with group I and group II. Systolic blood pressure increased maximally in group I (P0) and group II (P75) 1 min after direct laryngoscopy and endotracheal intubation from baseline (32.1% from baseline). In group III (P150) maximum rise in blood pressure was 11.1% from baseline. Among these only pregabalin 150mg attenuated the rise in blood pressure following laryngoscopy (p-value=0.001). There was no statistically significant difference between placebo and pregabalin 75mg in attenuation of systolic blood pressure.

IX. SUMMARY AND CONCLUSION

1. There was no significant difference in heart rate among groups before and after premedication. Immediately after laryngoscopy and intubation, the heart rate increased significantly in all groups, increase was least in group III. Maximum increase in heart rate from baseline was observed after 1 min of laryngoscopy. No statistically significant attenuation of heart rate was observed in the premedicated group, although it remained stabilised in group III as compared with group I and II.

2. Systolic blood pressure increased maximally in group I (P0) and group II (P75) 1 min after direct laryngoscopy and endotracheal intubation from baseline (32.1% from baseline). It gradually decreased to near baseline values over 10 minutes. In group III (P150) maximum rise in blood pressure was 11.1% from baseline. Among these only pregabalin 150mg attenuated the rise in blood pressure following laryngoscopy (p-value=0.001). There was no statistically significant difference between placebo and pregabalin 75mg in attenuation of systolic blood pressure.

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Mystical poetry -- Sri Aurobindo and Sir William Blake in comparison.

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Abstract
As one grain of rice is enough to test if the whole pot of rice is boiled, a few lines of poetry of the great luminouries [i.e.] Sri Aurobindo of the East and Sir William Blake of the West testify that great minds think alike. Both Aurobindo and Blake had a strong spiritual intention of discovering the infinite in all things. Though both had one vision their directin and method was a bit different. Blake’s philosophy differed from primitive animism but resembled that of Aurobindo in his subtelity of apprehension, in spiritual discipline and above all in its recognition of unity in all things. He was a mystic who had a perception of some great absolute truth and he acted upon this realisation. His mystic expression longed for a complete harmony with the transcendental Order.

Born in a family of dissenters Blake was imbued with a deep sense of piety, enthusiasm and vision. From a very young age he claimed that he saw God’s appearance; Even the rising sun seemed Godly vision;-

‘Then the Divine vision like a silent sun appeared above.’ [-Jerusalem, plate 96]--1

Blake’s spiritual intent was not other-worldly and had no concern with heaven elsewhere. He intended to discover the Infinite in all things. He felt that nothing is more real than the Universe of forms, both of the outer and inner world. The living person as Blake understood was the One in whose being all forms and images are perpetually generated. He arrived at the profound truth that there is nothing in heavens or upon the earth which does not also exist in man and God.

Blake was a mystic who sought for truth and dealt with human toil and turmoil all the time. There are features of his thought that contain shrewd psychology beyond the subtlest understanding of men and women. To the mystic, God is the nucleus of creation. The mystic begins with a submission to the Divine order which he accepts with such conviction that earthly life becomes nothing to him. Whereas Aurobindo arrived at a particular yogic practise called Internal Yoga and deep meditation for reaching God, Blake insisted upon man purifying himself of all sins like pride, envy and jealousy. In addition to external fetters, man by no means is free from pride, envy and jealousy and the reciprocatory stages of man becoming divine and Divine extending His mercy to the human was possible because God sent His son to the world to undergo the pain and suffering of man and to teach him mercy, compassion and forgiveness to overcome his vices. Blake as a christian emphasizes on the birth of this Holy man as the example to show that the ever-merciful Lord is waiting patiently for man to purge himself of all the worldly vice.

In addition to being a poet-seer, Blake was a painter and engraver of unique importance. Not properly schooled but for painting and engraving Blake was not very careful in grammatical constructions of his
sentences but nevertheless he was able to convey his experiences powerfully through his poetic and proseic medium. His poems were greatly influenced by the spirits and visions he experienced and he even claimed that the spirits dictated his writings.

**Key words**: Aurobindo, Blake, mysticism, philosophy

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**Mystical poetry -- Sri Aurobindo and Sir William Blake in comparison.**

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**Introduction**

Knowledge is developed by curiosity and the truth is arrived at by research. Time immemorial, philosophers and physicists have tried to arrive at some conclusion regarding the creation of the universe and the questions of time and space. The understanding developed by them is that the supreme consciousness desired to have its representatives in the lower consciousness and therefore manifested in them. Sri Aurobindo was convinced that God created the universe and manifested in His creations. The two mystic poets Sri Aurobindo and Sir William Blake drew their theory and concept with their firm belief that God created the Universe and manifested in His creations.

**Elaboration**

According to the Christian faith God loved mankind so much and was so compassionate that He sent His own son to the world to undergo similar experiences and suffer like any other human being, at the same time have the divine love, pity and mercy. Whereas Sri Aurobindo believed that the human beings can, by their persevering effort of prayer, meditation and staunch mental discipline can become divine or in his terms, superhuman, Blake believed that man should cleanse himself of vices like pride, envy and jealousy to become divine. Man’s senses lead to sin. Man must endeavour to overcome the temptations of the five senses. In ‘Everlasting Gospel’ he states,

Life’s five windows of the soul
Distorts, the heaven from pole to pole
And leads you to believe a lie
When you see not with but though your eye’ [lines 96 to 102]--3

Falling in line with Blake’s opinion that man should be free from his mind-forged manacles, Sri Aurobindo states--

There is no ‘I’, no nature, known and unknown
Only the illimitable permanent

is here [Nirvana 31-34]-4
He took the divine task of helping others uncover what was hidden within themselves [ie]their higher self. His poems depicted God as the prime mover and dealt with man’s relationship with God. This esoteric tradition viewed spirit and matter, light and darkness, time and eternity, above and beneath as complimentary principles both alike rooted in a divine essence. He firmly believed that we are all co-existent with God and are members of one big family. Sri Aurobindo and Sir William Blake had a sacred mission of going beyond their own self and revealing cosmic grandeur. Blake’s poetry was unique in encompassing a wide range of deep emotions arousing from the influence of the spirits and visions that visited him.

A large number of critics have noted the influence of Hindu mythology in Blake’s writings. In 1902 Foster Damon claimed that Blake’s thinking and writing were in accordance with the Eastern mysticism. In 1947 Frye observed in ‘Fearful symmetry’ that Blake was one among the European idealists to link his tradition with that of the Indian classics, including his last drawing based on Wilkins’ translation of the Bhagavat Gita. This influence led him to state the aphorisms ‘There is no natural religion’ and ‘All Religions are same’ [1788]-2. Blake and Aurobindo were of the opinion that spirit and visions were not cloudy vapours but are organised and minutely articulated beyond all the natural and perishing materials of nature.

Mystic, scholar, poet, sage, journalist, statesman, freedom fighter, - with his sublime personality Sri Aurobindo explored the depth of divinity and human consciousness. He is called as ‘Treasurer of sublime dreams’ [Preface by Dilip Kumar Roy]. This sage of the great age sought to bring from above a super-consciousness which would guide and control the spiritual life and actions of mankind. He dreamt of a day that will bring together the people of the globe.

The basic philosophy is given in a wide context which relates to the seen and unseen world. He believed that the harmony of life takes a long time to aquire and more careful study. His insight springs from every world- religion and from many languages. He draws them together elegantly with fascinating cross-references and keen insight into the customs, words and invention of the world's greatest spiritual books. For more than six years he poured forth on the philosophy of Being and Becoming, the acumen of man, nature and God. His writings offer a thorough study on the nature of man's existence and God's presence, and a formation of vast synthesis of knowledge, harmonising world's greatest traditions - Occidental and Oriental.

Blake and Aurobindo were born and brought up in entirely different cultures and beliefs in different parts of the globe, but they started getting inspired, rather, had visions and spiritual experiences which they expressed mostly in similar ways and at sometimes in different terms. They both strongly believed in their weird experiences and felt that they were dictated by spirits who guided them in their vocation and daily chores of life. These two visionaries have brought out their opinions and firm belief in the development and creation of new human being, perhaps a spiritual superhuman through transcendence and transformation.

Both had a firm conviction that God is manifest in His creations both human and nonhuman; There is universal self and the world is a very big universal family. If man cleanses himself of all vices the Infinity will in all glory appear to him. Mystical illumination is something to be deeply felt after evere practise and this experience can never be passed on or communicated. Transcendence or elevation through mystical experience is a total separation of the human from the Divine. It also expresses the possibility of attaining God-head.
Whosoever goes into that transcendent regions to behold the glory of God himself becomes the glory and God. This is the magical charm of mysticism and that glory transforms the human into divine. To paraphrase Tagore’s words: They dive down into the ocean of the forms hoping to gain the perfect pearl of the Formless. Enlightenment after a mystic experience makes the soul bath in light which is not bound by space, and listen to an eternal music and break into a fragrance not borne away by the wind.

According to Aurobindo we must return and seek all sources of life and strength within ourselves. It is the spiritual revolution we see and the material is only its shadow and reflex. To quote the unforgettable and very often quoted lines of Blake:

To see the world in a grain of sand
And Heaven in a wild flower,
Hold infinity in th palm of your hand
And Eternity in an hour’ [from ‘Auguries of Innocence’ ]-5

Sri Aurobindo uses the same phrase in his epic ‘Savitri’
‘Almost she nears what never can be attained
She shuts eternity into an hour
And fills a little soul with the Infinite.’-6

The phrase ‘an hour into infinity’ conveys the illimitable power which encompasses the cosmos and relieves men of their shackles of death.

His contribution to the society is the philosophy of ascent of man to divinity and the descent of God to Humanity and the evolution of supreme consciousness brings the cosmic vision down. To Quote the great epic ‘Savitri’-

A cosmic vision a spiritual sense
Feels all the Infinite lodged in the finite form
and seen through the quivering ecstasy of light
Discovers the bright face of the bodiless
in the truths of the moment’s soul
Can sip the honey-wine of Eternity [Savitri’- book IV canto X]---7

The following lines from the same text stand testimony and indicate the kind of boon that he aspired for.

Thy embrace which rends the living knot of pain
This joy, o Lord, in which all creatures breath
Thy magic flowing waters of deep love

Thy sweetness give to me for earth and man.[697]

---8

He believed that man lives mostly by his surface life, mind and body but there is an inner being which aspires for greater beauty, harmony, power and knowledge. Man has to awaken his inner soul to reach a reality beyond a spark of the divine fire. The origin of Aurobindo’s mysticism can be traced back to his return from abroad to Apollo Bunder in Bombay where a vast calm descended upon him and this calmness remained for a long time. His training under Yogi Lele Maharaj in Baroda was so intense that he achieved the glory of sainthood or Nirvana in three days.

He had great visionary power and experienced hallucinations. He gave a new dimension to the theory of creation and felt that if man cleanses himself of his wickedness and vice he can reach the god-head and this he called transcendence. Starting from his small poems and ending in the great epic 'Savitri' Aurobindo never failed to mention the co-existence of God along with man, waiting for man to get ready by cleansing his soul for better purposes and this stage he called being 'superhuman'. His integral yoga and mental discipline led to his arriving at the theory of involution, a further step from evolution.

He believed in seeing beyond senses and reaching at a higher vision which enables a man to have imagination beyond human understanding and level. This macro-visions can be explained with a mini-vision of a child holding a small bit of paper placed beneath a small lens which in all probability brings the image of the circle of the sun in miniature on the piece of paper. Therefore Sri Aurobindo concluded that God is manifest in the tiny beings He created. This is the understanding of a the ultimate consciousness and endeavouring to reach the cosmic consciousness.

Mystics hold that there is a deeper and fundamental state of existence beneath the appearances of day-to-day living. The unity with the higher consciousness is both internal and external, focussing on seeking the truth about one self, one’s understanding with the others and reality. The mystical state is the bursting of the soul into the little flame of the divine to mingle with the source. The poetry of Sri Aurobindo brings our whole conscious being into relation with the Divine, praying Him to transform our lives into eternal.

He felt that the world is a manifestation of the divine and matter is but a form of the spirit. By his constant effort man can widen and heighten his consciousness and transmute the body appropriately so that it can be a new vehicle of consciousness. ‘The spiritual aspiration is innate in man; For, he is, unlike the animal, aware of imperfections and limitationas and feels that there is something to be attained beyond what he now is.’ [Life divine 843]-10

Mysticism starts appearing in the small poems starting with 'Who' In which the poet affirms the manifestation of God in His creations and the invisible hand as that of a painter rocking the earth to activate the life. The fine images with fine epithets flow endlessly and bring the colourful images of God. God is in the laugh of a boy and the blush of a girl. The poet questions the unique identity of the personality of the the creator. He wonders,

In the blue of the sky, in the green of the forest

Whose is the hand that has painted the glow?
when the winds were asleep in the womb of the ether

who was it that roused them and bade them to blow?[OP Mathur, p 26]---10

in 'The Rose of God' lyric impulse merges with the philosophic, mystic strains and rises to higher potency and even visual beauty. Rose itself is the symbol of divine love and 'Rose of God' is a prayer for the descent of God's grace- symbolically describing the blossoming of God in the garden of love with bliss, light, power, life and love. Man is but a shadow and his knowledge is like a veil; Man's earthly delight is labouring in the opposite direction, making the rose curled and dry. Man feels dull and dispirited; is unable to differentiate between real knowledge and the dull rut of bookish knowledge. He uses the symbol in his *magnum opus* 'Savitri'

Time is personified as a drama or a pageant's dream in the poem 'Transformation'. The poet's nerves have been transformed into channels of rapture for the influx of the Supreme. The poem depicts the poet's ecstatic delight of having realised God's presence. He is not the slave of nature any more and is free from the mesh of senses. The comparison between the Infinite and the giant is expressed in the following lines-

I have drunk the infinite like the giant's wine' -11

The last three lines of the poem reveal the poet's ecstatic delight -

My soul unhorizoned, widens to measureless height

My body is God's living tool

my spirit a vast sun of deathless light -12

Aurobindo's poems are exercises which he called sadhana for the advent of a new consciousness to cleanse the earth of all evil and usher in, the life divine. As a mystic he knew what he felt not because of any earthly gain but because without the mystical light, life is a blind alley.

In the vast impenetrable universe the human being is a tiny part; he does not know its mysteries.

Impenetrable, a mystery recondite

In the vast plan of which we are part

Its harmonies are discords to our view

Because we know not the great theme they serve [Savitri, 160]--13

Mystic poetry is subtle and suggestive; Mere intellect cannot decipher the meaning or essence. It stirs the deeper inner mind. The mystic visualises the world of a divine reality behind the ordinary world of sense and matter. In 'Hymns to the mystic fire' we find he following lines. 'the doctrine of the mystic recognises an unknowable, timeless and unnameable, behind and above all things, not seizable by the studious pursuit of the intellect'-14 God is manifest in all beings in all creations and sometimes it is difficult for the mystic to separate and identify the human and the divine because 'All is boundless He'[ The unseen infinite'] our vision is His vision and our understanding is His understanding. The poet continues in the same poem-
In His ray that dazzles our vision everywhere

Our half-closed eyes see the fragment of the One;

Only the eyes of the immortality dare

To look unblinded on the living sun.[Ibid]--15

Aurobindo felt that the world is a real manifestation of the Divine and matter is but a form of the spirit. He also felt that man by his tireless efforts and strong will, man can widen his consciousness and train the body appropriately so that the renewed physic will be the new vehicle of consciousness. The spiritual aspiration is innate in man. for, he is unlike the animal, aware of imperfections and limitations and feels that there is something to be attained beyond what he now is. [Aurobindo, 843] Man is a transitional being. His position is not final. Still there are mental elevations to be climbed purging oneself of negative feelings of anger, jealousy, envy, and to mention the Seven deadly sins, to say. Poetry is of a noble quality and sometimes poets are called prophets. According to Aurobindo 'Poetry draws into itself a fuller language of intuitive inspiration, illumination or the higher thinking and feeling that is found in the Upanishads and the Vedas and the passages of the Gita' [135] as found in the notes on 'Savitri'.

In the poem 'Thought the paraclete' the holy spirit rises high and high in the colourful sky 'As some bright archangel in vision' The poet is able to glance the face of the luster, gleaming over the summits of the Timeless Being.'The Blue bird' is another lyric where the blue bird symbolises the individual soul. It indicates the mind-power or the power of the soul. The symbolic fire of the image represents the poet's soul. The bird symbolises a vehicle of God the blue bird transcends worlds.

I am the bird of God in his blue

Divinely high and clear

I sing notes of the sweet and true

for the God and seraph's ear.[16]

The bird soars beyond time and space; The flight is like the flight of the spirit and soul towards heaven. Another poem of mystic delight is entitled 'Invitation'. Written in Alipur jail after the vision of Lord Krishna, the poem motivates the readers to undergo rigorous practice to see the Divine. 'A God's labour' is Indian in theme. The tendency of the human to spur the Divine because of lack of vision is enumerated:

The Truth of truths men fear and deny

The Light of lights they refuse

To ignorant God they lift their cry

to or a demon-altar choose-17

The poem 'A Tree' stands testimony to Blake's statement 'A fool sees no the same tree as a wise man does'[18] The poet shows the man's soul struggling to reach out to heaven, like the branches of a tree that try to reach out to the sky. The persevering efforts of man by his penance and prayers to reach heavens is nevertheless a truth but how may succeed in their efforts, is very uncertain. To quote a few lines -
A tree beneath the sandy river-beach
Holds up its top-most boughs
Like fingers towards a heaven they cannot reach
Earth-bound, heaven-amorous
This is the soul of man, body and brain
Hungry for reach other our heavenly flight detain.[lines 42-47] -18

Another poem of mystic delight is 'Invitation' written in Alipore prison. This poem resonates with divine energy. Having had the vision of Bhagavan Vasudeva under the trees and inside the prison, the poet calls for the followers to realise inner freedom and peace. The poem resonates with inner energy[,] soul-force .

The knowledge of the Divine and the revelation of the spirit are a kind of apotheosis as found in the poem 'Revelation' where the passing glimpse of the Great Almighty is revealed;

Someone leaping from the rocks
past me ran with wind-blown locks
like a startled bright sunrise
Visible to mortal eyes [47]--20

Both Blake and Aurobindo create a world which allure man from the phenomenal world. In the inspired moments there is a tremendous transformation in the individual consciousness and there is a poetic grasp of metaphysical truth. They are inspired by the transcendent power immanent in man; Inspiration occurs in unusual and exceptional moments.

Blake transcended his own self In his poems ‘Songs of Innocence’ and ‘Songs of Experience’ He showed mystic leanings in highlighting the manifestation of God in his creations and the diachotomy of desires and wishes of youth is contradicted with the experience and wisdom of oldage. The trend of his imagination is towards the evocation of things without form. The creation of Beings exist in his imagination or in the nebulous kingdom of his dreams. His vision of life is clear and naive. He delights in the physical attributes of nature, its breath and wonders of light and motion, of forms and melody. The essence of all is set forth in the poetic piece entitled ‘Divine image’ which delineates the spirit of mercy, pity, peace and love. Here his vision of the divine image is that of the spirit which is at once universal and particular.[ie] God and man;

Both the poets had cosmic consciousness. The prime character of the cosmic consciousness is that it is constantly aware of the cosmos; the life and order of the universe and eternity happens to be the theme of both the poets. Both enlightened the people about the soul of man. Their expanding affections embrace universal man and societal human being. They were endowed with spiritual insight and bright visitations from the inner realm of thought.

They stood out as most illumied minds from which cosmic wisdom sprang. They knew the wonders witin
human beings and attempted to enlighten them towards looking up to God. Both were involved in politics but their spiritual inclination was more powerful. Both firmly believed that God does not exist apart from man. They also felt that we are men fallen not from God but from ourselves. Man is a potential collaborator with God. The supramental manifestation can intervene and change the purblind mind of man with an onrush of the supermind with radiance and knowledge. In this connection Sri Aurobindo was confident that a mind of light would replace the present darkness of earthly ignorance.

The writings of Sri Aurobindo culminate in the epic ‘Savithri’ which he entitled ‘A Legend and a Symbol’, considered as his spiritual autobiography. It is based on the story from the Hindu epic Mahabharath. Aurobindo entitled the epic ‘A Legend and a Symbol.’ The story of Savithri arguing with the Lord of Death to give back the life of Sathyavan, her husband, maybe something unbelievable but as most saints and sages claim it all depends on the mind. In the interplay between man and the Gods it is a prayer, a right request and a rightful demand. The prayer and request are fulfilled because the pleader, for her own cause again is a very pious virtuous woman of no sin. It is an incomplete epic of 24000 lines and Aurobindo claimed that he took a break in between when his consciousness was elevated to a higher level each. The mutual longing between the human and the divine to reach out to each other is depicted in the following lines:

A mutual debt binds the man to the Supreme
His nature we must put on as He put on ours
We are the sons of God and must be even as He
His human portion we must grow Divine’[‘Savithri, [I, 4]--22

One can consider a statue as a statue or some energy depicting the power of God; As when Aurobindo stood transfixed in front of the idol of kali matha and got almost tranmuted in thought. The central theme revolves around the transformation of man as the consummation of terrestrial evolution and the emergence of supramental race upon the earth. There was a felt vision of transcendental reality, a a consummation of all mystical experience. The following lines of the epic make this evident:

A key turned in a mystic lock of time,
but where the silence of the Gods has passed
A greater harmony from the stillness
Surpassed with joy unborn and a sweetness yearning
An ecstacy and a laughter and a cry’[23] time.

Aurobindo’s message to the society is indirectly conveyed through the epic which elaborates the triple prayer from Brahadaranyaka upanishad and which can be everyone’s prayer:

Lead me from non-Being to Being
From Darkness to light
From death to immortality’[25]
understanding mystic poetry is like yogic breathing. such reading and understanding brings the reader close to the writer.

He claimed it as new dimension of mystical poem and he was not surprised by the time it took for the readers to understand and appreciate. In all acceptance, he stated that it took at least a hundred years for Blake to be understood and appreciated.

The claim or argument of this article is to emphasize on the similarity of the philosophical and deeply mystical tendencies of Sri. Aurobindo and Sir. William Blake. To sum up the article, Both echo the vedic precepts of the divine wisdom of man being led from darknes to light ignorance to wisdom and death to eternal life.

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The Trigonometric Representation of Complex Type Number System

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Abstract- An extension to the classical complex number system from the space of real sequences was proposed. We show that the new complex type number system forms a field over the real or complex field with infinite dimension. We explore some possible exponential and trigonometric formulations this new complex type numbers and investigate their properties. The complex type numbers are used to represent three dimensional physical spaces with Cartesian coordinates.

Index Terms- Cauchy-Riemann conditions, Euler’s formula, Harmonic polynomials, Hyper-complex numbers.

I. INTRODUCTION

The real number system, naturally identified and known from the early period of philosophical era and now denoted by \( \mathbb{R} \), is a field with two basic binary operations, namely, addition and multiplication, having the well-known properties shortly listed as closed-ness, commutative, associative and distributive properties, existence of identities and inverses for both operations along with the assumption that the additive and multiplicative identities are distinct.

The development of mathematics is so heavily dependent on this fundamental number system that any other number systems sought are evaluated for their usability based on having these basic field properties—some or all of them. In this connection, the only number system having all of the above mentioned field properties is the complex number system.

Inspired by the vast usability of complex number system in many areas, search for higher dimensional extensions of this kind had been an active research interest in the past.

The early extensions were defined on finite dimensional spaces. As it is now known and proved that the only finite dimensional spaces with all the field properties are the real the complex number systems, these attempts for higher dimensional number systems have obviously failed. Hamilton[4] dedicated his entire life for this failed attempt. Finally, in 1847, he came up with 4-dimensional quaternions which lack one of the properties of field—the commutative property.

Since then higher dimensional extensions of complex numbers were focused on relaxing some of the field properties. The commutative and associative properties are relaxed in quaternion[5] and octonion[5] respectively. Clifford Algebra also relaxes the commutative property. Recently, Fleury et al[5] defined a multi-complex number system relaxing the existence of inverse of all non-zero multi-complex numbers.

In this paper, we propose a class of number systems of infinite dimension which retains all the properties of field. Although this number system is infinite dimensional, it can be applied to represent points and functions in three and higher dimensional Cartesian spaces. We call our new number system the Complex Type Number system.

The motivation of the definition of complex type system comes from an attempt for a generalization of the fact that the complex valued analytic functions of the two dimensional Cartesian coordinate variables \( x \) and \( y \) constitute a pair of real valued harmonic functions. Our complex type representation gives a canonical extension of this property to functions of higher dimensional coordinate variables. Beyond these, by the complex type field with some generalizations, other basic properties of complex type numbers such as trigonometric functions representation, De Moivre’s formula and Euler’s formula for exponential representations are satisfied.

In any finite dimensional space, our construction of complex type numbers can be readily extended to satisfy the harmonic function property for functions. In this paper we restrict our discussion to function in three dimensional variables only which can be directly extended to higher dimensions. In this context, we see that our complex type representation is a natural extension of the classical complex space \( \mathbb{C} \) in the sense that our complex type space include \( \mathbb{C} \) and that the fundamental algebraic, trigonometric, exponential representations and holomorphic properties of function are carried out to the extended complex type space with some modifications.

This paper is organized as follows: In Section 2 the definition of complex type number system and its basic properties are given. In Section 3, the extended trigonometric and exponential representation and their identities are established. In Section 4, the analytic properties of complex type valued functions based on derivatives of these functions are described and finally, a conclusion is drawn in Section 5.
II. DEFINITION AND BASIC PROPERTIES

Assume $t$ be a symbolic variable and $\mathbb{R}(t)$ be the space of infinitely differentiable functions with real coefficients. We define a $\mathbb{C}(t)$ as the set of pairs of functions $(a(t), b(t)) \in \mathbb{R}(t)^2$.

Definition 2.1. The complex type space $\mathbb{C}(t)$ is defined as the set $\mathbb{C}(t) = \{(a(t), b(t))|a(t), b(t) \in \mathbb{R}(t)\}$ with operations defined by

1. $\sum a(t) + b(t) = (a_1 + a_2, b_1 + b_2)$
2. $\sum a(t) \cdot b(t) = (a_1 \cdot b_1 - (1 + t^2) b_1 b_2 , a_1 b_2 + a_2 b_1)$, where $a_i, b_i \in \mathbb{R}(t)$, $i = 1, 2$.

Here, we have omitted the argument symbol $(t)$ in the functions in $\mathbb{R}(t)$ and denote $a(t)$ as a for brevity of notations.

Although we define the space consisting of functions of the symbol $t$, we are mainly interested in the coefficients of the powers of $t$ in the infinite series representation of the functions. In this context, the functions are regarded as generating functions of their coefficients. We denote the sequence of coefficients of a function $a(t)$ by $a$ itself so that when $a = \{a_n\}_{n=0}^{\infty}$, we have $a(t) = \sum_{n=0}^{\infty} a_n t^n$.

We refer the pairs of functions or the pairs of sequences as the “complex type numbers” and denote $(a(t); b(t))$ for the function form and $(a; b)$ for the sequence form. We use both notations interchangeably as they point to the same concept.

Alternatively, the elements of the space $\mathbb{C}(t)$ can also be expressed in the complex type form $a(t) + jb(t)$, where the ‘imaginary’ symbol $j$ satisfies $j^2 = -(1 + t^2)$. For a complex type number $a + jb$, we call $a$ and $b$, the real type and imaginary type parts of $f$ respectively.

The addition and multiplication for complex type numbers are in such a way that the rules of addition and multiplication are consistent with the rules of real numbers. Thus if $f_1 = a_1 + jb_1$ and $f_2 = a_2 + jb_2$, we have

$$f_1 + f_2 = (a_1 + a_2) + j(b_1 + b_2)$$

and

$$f_1 f_2 = (a_1 + jb_1)(a_2 + jb_2) = a_1 a_2 - (1 + t^2)b_1 b_2 + j(a_1 b_2 + a_2 b_1).$$

Our problem is to see whether the complex type space can be a candidate for a higher dimensional number system that allows analysis of function defined on the higher dimensional spaces.

Proposition 2.2. The space of complex type numbers $\mathbb{C}(t)$ forms a field under the defined operations. The elements of $\mathbb{C}(t)$ can be expressed in the complex type form $a + jb$, where $j^2 = -(1 + t^2)$.

Proof: By algebraic manipulations closed, associative, commutative and distributive properties of the operations are immediate. The zero element is $(0(t); 0(t))$, where $0(t)$ = 0 and the unit element is $(1(t), 0(t))$, where $1(t) = 1$. The inverse of a non-zero complex type number $f = (a; b)$ is

$$f^{-1} = \frac{(a; -b)}{a^2 + (1 + t^2) b^2}.$$  

The second elementary basis element $j = (0(t); 1(t))$ satisfies a coupled relation

$$j^2 = -(1 + t^2)(1(t), 0(t)) = -(1 + t^2).$$

It should be pointed out that the fundamental imaginary unit $j$ is a function of the symbolic variable $t$. There is a main difference between the present complex type formulation and the previous other formulation that the fundamental unit satisfies the condition of the form $j^n = -j$ for some power $n$.

Definition 2.3. Given $f = a + jb$, we define its complex type conjugate $f^*$ by $f^* = a - jb$

and its modulus (absolute size) $|f|$, by $|f| = +\sqrt{a^2 + (1 + t^2) b^2}$, where $a$ and $b$, the real type and imaginary type parts of $f$ respectively.

From the above definition, we see that the system of complex numbers has canonical extensions of many properties of their complex counterparts.

Proposition 2.4. For the complex type numbers $w, v \in \mathbb{C}(t)$ we have

1. $|w^*| = \frac{|w|}{2}$, $ii. \ |wv| = |w||v|$, $iii. \ w w^* = |w|^2$ $iv. \ w^{-1} = \frac{w^*}{|w|^2}$, $w \neq 0$

$v. \ w v = 0$ if and only if $w = 0$ or $v = 0$ $vi. \ |w| = 0$ if and only if $w = 0$.

Proof: By algebraic manipulation we can proof i. to v.
To prove vi., it is convenient to define a generating function  \( a_n(t) \) for a sequence  \( a = \{a_n\}_{n=0}^{\infty} \) as follows: For each  \( n \),  
\[ a_n(t) = a_n + a_{n+1}t + \cdots, \]
so that we have  \( a(t) = a_0(t) \) and  \( a_n(t) = a_n + ta_{n+1}(t), n = 0, 1, 2, \cdots. \)

Now, for  \( w = a(t) + jb(t) \), with  \( |w| = 0 \), we prove inductively that  \( a_n = b_n = 0 \) for all  \( n = 0, 1, 2, \cdots, \)

\[ |w|^2 = a_0(t)^2 + (1 + t^2)b_0(t)^2 = (a_0 + ta_1(t))^2 + (1 + t^2)(b_0 + tb_1(t))^2 \]
\[ = [a_0^2 + 2t a_0 a_1(t) + t^2 a_1(t)^2] + (1 + t^2)[b_0^2 + 2t b_0 b_1(t) + t^2 b_1(t)^2] \]
\[ = (a_0^2 + b_0^2) + 2t[a_0 a_1(t) + b_0 b_1(t)] + t^2[a_1(t)^2 + b_1(t)^2] + t^2[b_0^2 + 2t b_0 b_1(t) + t^2 b_1(t)^2] \]
\[ = (a_0^2 + b_0^2) + 2t[a_0 a_1(t) + b_0 b_1(t)] + t^2[a_1(t)^2 + b_1(t)^2] + t^2(b_0^2 + 2t b_0 b_1(t) + t^2 b_1(t)^2) \]
\[ = a_0^2 + b_0^2 + 2t(a_0 a_1(t) + b_0 b_1(t)) + t^2(a_1(t)^2 + b_1(t)^2) + b_0^2 + 2t b_0 b_1(t) + t^2 b_1(t)^2 \]
\[ = 0. \]

Equating the constant term to zero, we get  \( a_0^2 + b_0^2 = 0 \). Hence  \( a_0 = b_0 = 0 \).

Now consider
\[ w = a(t) + jb(t) \]
\[ = a_0(t) + j b_0(t) \]
\[ = (a_0 + ta_1(t)) + j(b_0 + tb_1(t)) \]
\[ = [a_0 + t(a_1 + ta_2(t))] + j[b_0 + t(b_1 + tb_2(t))] \]
\[ = [a_0 + ta_1 + t^2 a_2(t)] + j[b_0 + tb_1 + t^2 b_2(t)] \]
\[ = [a_0 + ta_1 + t^2 a_2 + \cdots + t^{n-1} a_{n-1} + t^n a_n(t)] + j[b_0 + tb_1 + t^2 b_2 + \cdots + t^{n-1} b_{n-1} + t^n b_n(t)] \]

Suppose inductively, that  \( a_i = b_i = 0 \) for  \( i = 0, 1, \ldots, n-1 \). We then get
\[ w = t^n a_n(t) + j t^n b_n(t). \]

Then,  \( |w| = 0 \) gives
\[ |w|^2 = (t^n a_n(t))^2 + (1 + t^2)(t^n b_n(t))^2 = 0 \]
\[ \Rightarrow t^n[(a_n + ta_{n+1}(t))^2 + (1 + t^2)(b_n + tb_{n+1}(t))^2] = 0 \]
\[ \Rightarrow [a_n^2 + 2ta_n a_{n+1}(t) + t^2 a_{n+1}(t)^2] + (1 + t^2)[b_n^2 + 2tb_n b_{n+1}(t) + t^2 b_{n+1}(t)^2] = 0 \]
\[ \Rightarrow a_n^2 + b_n^2 + 2t(a_n a_{n+1}(t) + b_n b_{n+1}(t)) + t^2[(a_{n+1}(t)^2 + b_{n+1}(t)^2) + (b_n + tb_{n+1}(t))^2] = 0 \]
\[ \Rightarrow a_n^2 + b_n^2 + 2t(a_n a_{n+1}(t) + b_n b_{n+1}(t)) + t^2[(a_{n+1}(t)^2 + b_{n+1}(t)^2) + (b_n + tb_{n+1}(t))^2] = 0 \]
\[ \Rightarrow a_n^2 + b_n^2 + 2t(a_n a_{n+1}(t) + b_n b_{n+1}(t)) + t^2(a_{n+1}(t)^2 + b_{n+1}(t)^2 + b_n(t)^2) = 0. \]

Thus, we have  \( a_n^2 + b_n^2 = 0 \) and hence  \( a_n = b_n = 0 \). This completes the proof.

To prove v., we see from ii. that  \( w v = 0 \) implies  \( |w v| = |w||v| = 0 \) and  \( |w| = 0 \) or  \( |v| = 0 \) which is a contradiction of  \( w = 0 \) or  \( v = 0 \).

We see that our new complex type space  \( \mathbb{C}(t) \) is an extension of the complex space  \( \mathbb{C} \) in the sense that  \( \mathbb{C} \) is included in  \( \mathbb{C}(t) \).

Specifically, the subspace  \( \mathbb{C}(0) \) of  \( \mathbb{C}(t) \) is the complex space consisting the constant coefficients of the real and imaginary type parts of complex type numbers.

### III. Exponential and Trigonometric Representations

In our complex type numbers formulation, we can formulate polar form through the functional approach. The following results show that the trigonometric and exponential functions representations and their properties in the classical complex space have canonical extensions in the complex type space.

For this purpose, we consider defining a complex type valued function of complex type variable as follows:
Definition 3.1. Let $F(.)$ be an infinitely differentiable real valued function of one variable and $w \equiv w(t) = a(t) + jb(t)$ be a complex type variable in $\mathbb{C}(t)$. The function $F(w)$ is defined as

$$F(w) = \sum_{n=0}^{\infty} \frac{F^{(n)}(\alpha)}{n!} (w - \alpha)^n,$$

where $\alpha$ is a real number in the domain of $F$.

Since $\mathbb{C}(t)$ is a field, one can easily see that $F(w)$ is a complex type valued function.

Now we will prove the following results concerning the exponential and logarithmic functions of a complex type variables.

Lemma 3.2. The exponential function $\exp(w)$ satisfy the relation $e^{w+\nu} = e^w e^\nu$.

Proof. By Definition 3.1, the exponential function is given by the series form

$$e^w = \sum_{n=0}^{\infty} \frac{w^n}{n!}.$$

Now, for the complex type variable $u, \nu$, we consider

$$e^{u+\nu} = \sum_{n=0}^{\infty} \frac{(u + \nu)^n}{n!} = \sum_{n=0}^{\infty} \frac{1}{n!} \sum_{a+b=n}^{\infty} \frac{u^a \nu^b}{a! \, b!} = \sum_{a=0}^{\infty} \frac{u^a}{a!} \sum_{b=0}^{\infty} \frac{\nu^b}{b!} = e^u e^\nu.$$

Theorem 3.3. The complex type numbers $w \in \mathbb{C}(t)$ can be expressed in a polar type exponential formulations $w = a + jb = \rho e^{i\theta}$, where $\theta \equiv \theta(t), \rho \equiv \rho(t)$ are functions of the symbolic variable with real valued coefficients.

Proof. We define $\ln w$ using Definition 3.1 with $\alpha = 1$. Hence, $\ln w$ can be expressed in a complex type form $\ln w = \lambda(t) + j\theta(t)$.

In the meantime, it is easy to see that $\exp(\ln w) = w$ by the same Definition above by the expansion of the real valued function $\exp(\ln x) = x$ about $x = 1$ again.

This gives, $\exp(\ln w) = 1 + w - 1 + 0 + 0 + \cdots = w$.

Hence we have, by Lemma 3.2

$$w = e^{\lambda(t)} + j\theta(t) = e^{\lambda(t)} e^{i\theta(t)} = \rho e^{i\theta}.$$

Where $\theta \equiv \theta(t), \rho \equiv \rho(t)$.

Theorem 3.4: A complex type number $w = a + jb$ can be expressed in a trigonometric type Euler formulation given by

$$w = \rho (\cos \theta + \sin \theta)$$

and the trigonometric type functions are defined as

$$\cos \theta := \cos(\sqrt{1 + t^2} \theta) = \frac{a}{\rho} \quad (1)$$

$$\sin \theta := \frac{\sin(\sqrt{1 + t^2} \theta)}{\sqrt{1 + t^2}} = \frac{b}{\rho}. \quad (2)$$

Further, the trigonometric type functions satisfy the De Moivre’s formula:

For an integer $n$,

$$(\cos \theta + j \sin \theta)^n = \cos n\theta + j \sin n\theta.$$

Proof. In view of Theorem 3.3, we have

$$w = \rho e^{i\theta} = \rho e^{i\sqrt{1 + t^2} \theta} = \rho \left( \cos \left( \sqrt{1 + t^2} \theta \right) + i \sin \left( \sqrt{1 + t^2} \theta \right) \right) = \rho (\cos \theta + j \sin \theta).$$

where the trigonometric type functions are defined.

By proposition 2.4, $|e^{i\theta}| = |e^{i\sqrt{1 + t^2} \theta}| = 1$, and hence $\rho = |w|$. Here, the relations between the exponential and trigonometric type functions are establish regarding them as infinite series.

The De Moivre’s type formula is then an immediate consequence by induction.

It is not recognized whether the real coefficients of $\theta(t)$ have any geometric or trigonometric meaning because we have identified $\theta(t)$ from the concepts of infinite series representations of the functions involved. It is, however, observed that the first coefficient $\theta(0)$ is the classical angular argument of the complex number $f(0)$.

We derive some identities for the trigonometric functions that are similar to the corresponding identities to their trigonometric counterparts.
Theorem 3.5. The trigonometric type functions satisfy the following identities:

1. \( \cos^2 \theta + (1 + t^2) \sin^2 \theta = 1 \),

2. \( \cos (\theta_1 \pm \theta_2) = \cos \theta_1 \cos \theta_2 \mp (1 + t^2) \sin \theta_1 \sin \theta_2 \),

3. \( \sin (\theta_1 \pm \theta_2) = \sin \theta_1 \cos \theta_2 \pm \cos \theta_1 \sin \theta_2 \),

4. \( \cos 2\theta = \cos^2 \theta - (1 + t^2) \sin^2 \theta = 1 - 2(1 + t^2) \sin^2 \theta = 2 \cos^2 \theta - 1 \),

5. \( 2\theta = 2 \sin \theta \cos \theta \).

**Proof:** It can be proved by direct manipulation of their classical version.

IV. CONCLUSION

A complex type space for a real sequence is proposed. The complex type space is the canonical extension of the classical complex space in the sense that the fundamental trigonometric, algebraic and exponential properties are carried to the proposed space with some extensions.

REFERENCES


AUTHORS

**First Author** – ThayamathyPio Jude Navinthan, Department of Mathematics, Eastern University, Sri Lanka.
Expropriation and Compensation Challenges for Road Construction in Yeka Sub City, Addis Ababa, Ethiopia

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M.sc in Urban land Development and management, institutes of urban development studies, Ethiopian Civil Service University

Abstract- Expropriation and compensation for road construction are currently big issues and have many challenges which are more unique than for redevelopment. This research focuses on the capacity of the institutes, workflows, perception of expropriated and rules effectiveness in expropriation and compensation. This research helps for scholars to see and pave for further research; and for city government to implement expropriation and compensation in an appropriate way. The research types used were descriptive research and data were collected through a questionnaire and interview. Primary data and secondary data were used in this study. The samples were taken from official and expropriated landholders for asphalt road construction project site of CMC to WONDIRAD and ROOT school to BONO WUHA. In this focus ground, the difficulty existed not only human capacity building, but also lack of full human resources. The flow of works challenges for expropriation and compensation of road construction like inconsistency design and change of marks on the property of expropriated. In addition, the time given was too short from an authorized body to perform expropriation and valuation. Some expropriated landholders were not satisfied by expropriation and they were opposed due to compensation, and involuntary to leave and changes of plan once again. The rules were not effective due to non-considerations of the current site and ignorance of some expropriated. The compensation was not honest and descriptive detail for valuation. The implementation of rules in the study areas was not effective, due to discussion were not fully aware the expropriated, too short time given to expropriated, unfair compensation amount and exposition of expropriated to demolish their property more than two times which leads extra cost for them.

Index Terms- Expropriation, road construction, compensation, work flow, capacity building.

I. INTRODUCTION

According to FAO, (2008) in order to bring sustainable development governments should provide public facilities and infrastructure that ensure the well being and safety of the society, and safeguard and refurbishment of the natural environment. One of infrastructure facility is road transport, which plays a function of both production and consumption. Furthermore, roads can integrate other form of transportation. Provision of road for an urban area is the remedy for development and mostly performed by expropriation of private land holders through compensation. The purpose of expropriation is not mostly for private use rather it is of public interest. During expropriation individual right like the right to develop, use, and access are violated, though there might be differences from country to country in the context of their legal framework. For these reasons compensations become one phenomenon so as to respect the right of the landholders. In countries that deliver expropriation, compensation faces challenges in relation to the amount that should be compensated; and even though the amounts in legal aspects may be fair they faced implementation and cultural attached problems.

According to Ibrahim (2011) in his term paper Vol-004, In Ethiopia the dominant mode is road transport, which accounts for 90 to 95% of power-driven interurban freight and passenger movements. But, road networks are limited and created difficulty in the provision of infrastructure for undertaking towards socioeconomic development, and poverty reduction (ERA, 2008a as sited in Ibrahim, 2011). In order to reduce poverty and facilitate the day to day activity, road development is essential. The first task before providing facilities and infrastructural services is acquisition of appropriate land (FAO, 2008).

In Ethiopia expropriation becomes one of the issues related to urban redevelopment, but little for road construction. The government of Ethiopia formulates different policy and strategies in relation to have clear, fair, and accountable implementation procedures. In these parts expropriation and compensation is one activity that takes place in order to benefit public (Proclamation 455/2005). This big task of expropriation and compensation are delivered by authorized body or parts of government organs like municipalities (Proclamation No. 35/2012).

The challenge that faces for expropriation and compensation were faced in our country in general and in the Yeka sub city in particular. Challenges can be seen as regulation, workflow, capacity and opposition from owners. In relation to the regulation and legal issues there is lease proclamation No 721/2011, expropriation proclamation No 455/2005, and Addis Ababa city government proclamation No 135/2005 and Directive 19/2006. This regulation incorporates compensation, but doesn’t fully been implemented. In addition, for fully expropriates the value at the center are not equal with the transitional zone; for partially expropriated the compensation amount is not fair. These make the expropriated landholders to oppose the compensation values. The other problem is human resource capacity building such as lack of trainings and full human resource.

II. MATERIALS AND METHODS

The research is conducted in the Yeka sub city, one of the ten sub cities in Addis Ababa, which is located 9°02'17” N and 38°50’ 05” E. The district is located in Northeastern suburb of the city.
The type of research was a descriptive, which described the challenges of expropriation and compensation in the Yeka Sub City. The research strategy that followed was case study type. The paradigm or the research's approach that research essentially developed was qualitative research, which describe qualitatively. The sampling techniques have been non probability sampling, which is used to select respondents of officials; and key informants were selected purposively but total expropriated landholders in the selected site areas were taken through senses method.

This research used both primary and secondary data sources. The primary data was collected by researcher from governmental bodies such as officials, leaders, communities that were affected by the expropriation and from some key informants. The secondary data sources for this research was taken from books, article, journals, and unpublished materials. These sources have legal, procedural and theoretical aspects. Constitutions, Proclamation, directives and manuals that are described in relation to expropriation and compensation were used as secondary data sources which are relevant to this research.

The methods of data analysis were both qualitative and quantitative data analysis. The quantitative data were analyzed using SPSS to generate percentage, table and graph. The data collected from interviews and open ended questions were analyzed by using content analysis. A description was prepared to reflect the discussion using participants own words.

III. RESULTS AND DISCUSSION

In this part human resource capacity of Urban Development and Renewal Office, work flow between the institution, perception of expropriated and their reflection, and rule and regulations effectiveness and implementation were described.

IV. HUMAN RESOURCE CAPACITY

The total number of workers in study area office was 36. In this office structural human resource requirement was 42. The institute requires eight skilled human resources that would worked in expropriation and compensation.

Table 1.1: Trainers and their capacity built

<table>
<thead>
<tr>
<th>S.N</th>
<th>Capacity building elements</th>
<th>Response</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Training</td>
<td>Yes</td>
<td>20</td>
<td>95.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>1</td>
<td>4.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>21</td>
<td>100.0</td>
</tr>
<tr>
<td>2.</td>
<td>Capacity built due to training</td>
<td>Higher</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium</td>
<td>7</td>
<td>35.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lower</td>
<td>5</td>
<td>25.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Not that much</td>
<td>8</td>
<td>40.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>20</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Based on field survey by the Author.

In table 1.1, Less than 5% of the respondent did not gain training. More than 95% got training, from which majority of the respondents that accounted 65% were responded that their capacity was built lower and not that much by the trainings. This was due to low frequency of training delivered and 35% of respondents’ responded training built their capacity at medium level. Nobody was responded their capacity was highly built through training.

Generally, In Yeka Sub City Urban Development and Renewal Office majority gained the training, that most of their capacity was not built that much, lower and medium level.

Table 1.2: Satisfaction of officials by training frequency

<table>
<thead>
<tr>
<th>Frequency of Training</th>
<th>Satisfaction on Frequency of Training</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>One time in one year</td>
<td>0</td>
</tr>
<tr>
<td>Two times</td>
<td>15.0</td>
</tr>
<tr>
<td>One time in more than a year</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
</tr>
</tbody>
</table>

Source: Based on field survey conducted by Author.

In table 1.2, Participant that most of them were trained at least twice a year were responded that their capacity built at medium level, whereas others that trained one time within a year and beyond a year were built their capacity not that much and lower. In this context of Capacity building for them, capacities were built for the majority was not that much and lower. Generally, the more they were participating in training were satisfied.

Table 1.3: Perception of capacity building through training by purpose of trainings to perform tasks

<table>
<thead>
<tr>
<th>Purpose of Trainings to Perform Tasks</th>
<th>Capacity Building through Training</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Strongly agree</td>
<td>Agree</td>
</tr>
<tr>
<td>Increase ability</td>
<td>Number</td>
<td>Percent</td>
</tr>
<tr>
<td>Make to be responsible</td>
<td>9</td>
<td>42.9</td>
</tr>
<tr>
<td>Helps to increase</td>
<td>2</td>
<td>9.5</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>71.4</td>
</tr>
</tbody>
</table>

Source: Based on field survey by Author.

In table 1.3, majority of respondents was strongly agreed training built human capacity, from them that accounted 42.9% strongly considered training as way of increased ability. 28.6% were agreed capacity would be enhanced through training from them majority that accounted 14.3% of the respondents
considered training enhanced customer satisfaction. Less of the respondents were agreed capacity would enhance through training and make to be responsible.

Generally, official respondents strongly agreed with trainings built capacity and their perception to perform tasks were training increases ability and customer satisfaction. Less of respondents that were agreed capacity can be built through training were believed that training makes responsible for performing tasks. In this context workers have better attitude towards trainings and its function.

V. WORK FLOW IN EXPROPRIATION AND COMPENSATION

Expropriation and compensation for road construction in the Yeka sub city requires the integration of the Addis Ababa Cabinet, Addis Ababa Plan Institutes, Addis Ababa Road Authority, Construction Industry Development and Maintenance Authority and Finance and Economy Development Office and Districts in different level. The Addis Ababa cabinet has the power to permit construction of road projects or other urban redevelopment. After giving permission Road Authority sends design that was approved by urban plan institutes. The plan institute has the authority to approve plan of the city. The road authority has delegated power to construct road, before it the plans, firstly approved by plan institutes that were designed by consultants or road authority officials. In addition, the authority mark area within identified color by indicating how many amounts would be expropriated and finally pay compensation after valuation approved and received from urban development and renewal office. Construction Industry Development and Maintenance Authority and Finance and Economy Development Office determines the current unit cost of construction inputs and which used as a means of performing valuation for Urban Development and Renewal Office for road construction.

As interview conducted in the study area, Yeka Land Development and Management Office holds six offices that are worked integrate, so as to achieve the goal of authority. Urban Development and Renewal Office/UDRO/ organized under Office of Land Development and Management. This office specifically performs expropriation and compensation within case teams and collaboration with other stakeholders. UDRO has five case teams and major tasks are achieved mission of the authority by making clear for road construction in a specific manner. Compensation Data Collector Case Team /CDCCT/ collect data of landholders based on design received form Road Authority. CDCCT take evidences of the physical aspect of property through photo and any legal owned evidences that landholders had on the property of expropriated. Compensation Valuator and Interpreter Case Team /CVICT/ take measures data from CDCCT and perform valuation based on the assigned value by encoding data into the computer system. Compensation Valuator and Interpreter Approval Case Team/CVIACT/ checked out valuation and compensation issue that were interpreted by CVICT. After clearly identified this case team finally transfer evidences for Place Clearance Case Team/PCCT/; in addition the final version of the approved evidence used for compensation if the landholders evidences are compatible with the Directive no 19/2006. Place Clearance Case Team/PCCT, mainly clear land for road construction. PCCT delivered tasks by integrating with districts. After accepting full evidences from CVIACT, then ordered landholders to take away their property that did not belong to compensation, but when the expropriated get the compensation they work with district to remove property for government. Mostly property of compensated are taken by expropriated through payment of 10% what they are compensated. Expropriated Rehabilitation Case Team/ERCT/ proposed different fund raising project to deliver rehabilitation for expropriated. ERCT take information from CVICT and perform a needs assessment of expropriated and then create linkage with NGOs, Small and Micro Enterprise, Education and Health Sector and Women, Youth and Children Affairs Office.

Table 1.4: Time given for expropriation and ways they make compatible with their plan.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Response</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time suffices to perform Expropriation</td>
<td>Yes</td>
<td>10</td>
<td>47.6</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>11</td>
<td>52.4</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>21</td>
<td>100.0</td>
</tr>
<tr>
<td>Amount of sufficient time permitted</td>
<td>More than one year</td>
<td>1</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>One year</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td>Less than one year</td>
<td>9</td>
<td>90.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>10</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Source: Based on field survey conducted by Author.

In table 1.4, 52.4% responded that the time given for expropriation for them wasn’t enough. 47.6% of respondents responded authority bodies give enough time. For respondents that responded time given to them was enough requested to specify the amount of time given; in these contexts that accounted 90% respond time given to them was less than one year. The remaining 10% of them responded that time given from authority body to expropriated was more than one year. In Addition interviewed respondents were responded that the time given for expropriation were not enough. Whereas, as Directive No 19/2006 declared any concerned body that want to be performed development like road, for demarcation approval the institute should give the design of the project before one year within clear and identifiable manner. Giving two months make the burden for landholders and even officials so as to perform what was requested. The landholders became not satisfied with the time given to remove their property.

As the interview was conducted in the work flow of expropriation and compensation, the challenges that were faced from Road Authority were inconsistency of design and given short period of time to perform expropriation. The plan was designed by Road Authority and approved by City Plan Institute. The Road Authority marked on the fence of landholders based on design. Then the order was transferred from Land Clearance Case Team to remove their property for landholders in project sites through Districts. After removal based on marked site they again construct fence. At the other time the design was extended to some area and ordered them ones again. Such activities make the extra cost to landholders. The integration among different
stakeholders decreases the problems that would face like inconsistency design.

Generally, short period of time given and inconsistency of design faced challengeable issue to expropriator. Expropriation is big issue that needs care, since it makes the loss of resource like capital and labor.

VI. SITUATION OF EXPROPRIATED DURING EXPROPRIATION AND COMPENSATION

This part of finding holds types of demolished or taken from landholders for road construction, hearing, feeling and participation of expropriated, acceptance of expropriation, complainant and their satisfaction.

Table 1.5: Type of property and information delivered for demolish.

<table>
<thead>
<tr>
<th>Property demolished and Information Delivered</th>
<th>Response</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types of property demolished</td>
<td>Fence</td>
<td>25</td>
<td>21.7</td>
</tr>
<tr>
<td></td>
<td>House</td>
<td>34</td>
<td>29.6</td>
</tr>
<tr>
<td></td>
<td>Fence and house</td>
<td>56</td>
<td>48.7</td>
</tr>
<tr>
<td>Total</td>
<td>115</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Time of Hearing about their property to be taken for road construction</td>
<td>Greater than 6 months</td>
<td>67</td>
<td>58.3</td>
</tr>
<tr>
<td></td>
<td>Greater than 3 months</td>
<td>31</td>
<td>26.9</td>
</tr>
<tr>
<td></td>
<td>Greater than 1 month</td>
<td>5</td>
<td>4.3</td>
</tr>
<tr>
<td></td>
<td>Less than 1 month</td>
<td>18</td>
<td>15.7</td>
</tr>
<tr>
<td>Total</td>
<td>115</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Based on field survey conducted by Author.

As collected data from the field, 21.7% demolished their fences. The 29.6% landholders’ house was demolished and 48.7% expropriated their fence and house. Generally, in the two project sites, the demolished property of landholders was a fence, house, and the fence and the house. Mostly demolished properties were fence and building.

The 65% of landholders heard expropriation would be performed before six months, 14.8% of respondents was heard about the expropriation issue before three months. Less than 5% of respondents were heard issues of expropriation before a month, and 15.7% of respondent were heard expropriation deliverable time less than one month. The respondents heard this information either formally or informally, but this information was not the exact time to leave the land within the identified demolished part and the amount of compensation.

As declared in directive No 19/2006 Road Authority prepared and deals with the plan institute for approval and then send a plan for Urban Development and Renewal Office. Then after, the office performed its own discussion with the community on the issue of road construction. The office selected representative from community through discussion. The aim of this meeting was making awareness that road would be constructed and selecting committees. It was not to remove their property because the demarcation or identification was not indicated.

Table 1.6: Acceptance of expropriation and their reason

<table>
<thead>
<tr>
<th>Variable</th>
<th>Response</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptance to Expropriation</td>
<td>Yes</td>
<td>67</td>
<td>58.3</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>48</td>
<td>41.7</td>
</tr>
<tr>
<td>Total</td>
<td>115</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Reason for Acceptance</td>
<td>I will benefit from this development</td>
<td>49</td>
<td>73.1</td>
</tr>
<tr>
<td></td>
<td>Does not create any problem for me</td>
<td>2</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>The road constructed previously were more difficult</td>
<td>16</td>
<td>23.9</td>
</tr>
<tr>
<td>Total</td>
<td>67</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>Reason for not accepting</td>
<td>Expropriation highly affected</td>
<td>20</td>
<td>41.7</td>
</tr>
<tr>
<td></td>
<td>I didn’t like to leave my land</td>
<td>15</td>
<td>31.3</td>
</tr>
<tr>
<td></td>
<td>The compensation may not be enough</td>
<td>6</td>
<td>12.5</td>
</tr>
<tr>
<td></td>
<td>I lost my neighbor and not benefited from Development</td>
<td>3</td>
<td>6.3</td>
</tr>
<tr>
<td></td>
<td>The road could be constructed without affected me</td>
<td>2</td>
<td>4.2</td>
</tr>
<tr>
<td></td>
<td>Fear of unknown</td>
<td>2</td>
<td>4.2</td>
</tr>
<tr>
<td>Total</td>
<td>48</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Based on field survey conducted by Author.

As shown in table 1.6, more than 58% of respondents were accepted expropriation, from them majority of respondents were reason out the acceptance they would benefit from development, less than 24% were reflected previously constructed road was difficult, and 3% of respondents which is insignificant reason out acceptance of expropriation as did not create any problem for them. 41.7 % were not accepted expropriation, from them 73% of respondents reason out opposition for expropriation were highly affected them and involuntary to leave the land. Less than 13% were opposed expropriation because of future expectation of compensation. The share of opposition expropriation due loss of a neighbor and didn’t benefit from development and constructed road would perform without expropriation was quite insignificant due to most of them were not fully expropriated and narrow nature of previously road.

Generally, Most of landholders were accepted expropriation and their reason was the future expectation of benefit and development and thinking current problem that faced due to poor quality and gully nature of the road.

As the interview was conducted with expropriated, landholders those mostly opposed were highly expropriated. Landholders were not happy with expropriation process and most of them were feeling sad. The given time and not participating in the development process made them not to accept expropriation process.

In relation to the procedure of expropriation and general perception one expropriated responded as follows:
In this road construction I lost many things like land, fence, and a house that I was feeding my children by renting a house. But this is already happening as you can see the road is not yet started construction. We removed our property last year, it is almost one year. Starting that time infrastructural facilities like light and water services are blocked. There is blow off the dust, and assumed how much it damages our health. In relation to compensation, as I tell you I lost three shops that were constructed through building in good manner, for this property the compensation amount were 30,000 ET, which were not enough for demolishing. Even though I was paid 10 per cent of 30,000 ET birr to get compensation for demolishing property and I am not clear with this payment. In addition, my neighbor was not getting compensation, because of lack of money to pay the requested amount for their remains of demolished property. The time given to demolish was not enough. One day a letter was sent from district administrator to demolish, and they came in third day and said unless you have not demolished it, we demolish by force they said. Assume, it requires money, how can I get? Generally, these expropriations were not participatory and development was not performed as they were saying at first time, this is why some of them were opposed.

Table 1.7: Participation in the expropriation process by the satisfaction of expropriated in expropriation process and reason of not participating.

<table>
<thead>
<tr>
<th>Participating Expropriation Process</th>
<th>Expropriation Process</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Number</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Percent</td>
<td>7.8</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Number</td>
<td>3.4</td>
</tr>
<tr>
<td></td>
<td>Percent</td>
<td>3.4</td>
</tr>
<tr>
<td>No, reason for none participation</td>
<td>New in the presences of</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Number</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>Percent</td>
<td>40.9</td>
</tr>
<tr>
<td></td>
<td>None voluntary to</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Number</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>Percent</td>
<td>23.5</td>
</tr>
<tr>
<td></td>
<td>Another</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Number</td>
<td>18.3</td>
</tr>
<tr>
<td></td>
<td>Percent</td>
<td>18.3</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Number</td>
<td>88</td>
</tr>
<tr>
<td></td>
<td>Percent</td>
<td>76.5</td>
</tr>
<tr>
<td></td>
<td>115</td>
<td></td>
</tr>
<tr>
<td></td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Source: Based on field survey by Author.

Generally, most expropriated landholders were not participating in expropriation process; in the study area, participated in expropriation process were more satisfied than none participants.

Table 1.8: Expropriated feeling expression mechanisms and measures taken by government.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Response</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanisms of expression feeling</td>
<td>Through active participation</td>
<td>3</td>
<td>14.3</td>
</tr>
<tr>
<td></td>
<td>Through keeping silent</td>
<td>7</td>
<td>33.3</td>
</tr>
<tr>
<td></td>
<td>Through showing unwanted acts</td>
<td>6</td>
<td>42.9</td>
</tr>
<tr>
<td></td>
<td>Unknown</td>
<td>2</td>
<td>9.5</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>21</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Mechanisms to make the land free

- Using police: 7 (41.2)
- By negotiating them: 9 (52.9)
- Another reason: 1 (5.9)
- Total: 17 (100.0)

Source: Based on Field Survey Conducted by Author.

In table 1.8, more than 76% of official respondents were responded that expropriated expressed their feelings through keeping silence and showing unwanted acts. Less than 15% of respondent were responded that expropriated expressed their feelings through active participation and nearly 9% respondents were not identified way of feeling expression.

Generally, most landholders that accepted expropriation where leaving land immediately as compared to none accepted of expropriated land holders.

Table 1.9: Compensation offered satisfaction and its reason.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Response</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compensation offered</td>
<td>Yes</td>
<td>66</td>
<td>57.4</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>49</td>
<td>42.6</td>
</tr>
<tr>
<td>Satisfaction with compensation</td>
<td>Yes</td>
<td>6</td>
<td>9.1</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>60</td>
<td>90.9</td>
</tr>
<tr>
<td>Reason for not satisfying</td>
<td>Compensation is low</td>
<td>46</td>
<td>76.7</td>
</tr>
<tr>
<td></td>
<td>Inappropriate valuation of property</td>
<td>7</td>
<td>11.7</td>
</tr>
<tr>
<td></td>
<td>Late compensation</td>
<td>1</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td>Unequal treatment with others</td>
<td>3</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>Does not include location advantage</td>
<td>3</td>
<td>5.0</td>
</tr>
</tbody>
</table>

Source: Based on field survey by conducted by Author.

As shown in table 1.9, 57.4% of expropriated got compensation, whereas, 42.6% did not get compensation. Out of compensated 90.9% of them were not satisfied with compensation in which 9.1% were satisfied with compensation. The majority responded the reason for dissatisfaction of compensation was the lowest amount of compensation.

According to FAO, availability of ambiguous legal right makes the difficulty in the determination of equivalent compensation. As interview and questionnaire were conducted,
from the two project sites, CMC to Wondirade School majority of them received compensation. But in the current site of developed area of the Root school to the Bono Wuha project site, almost all of them did not get compensation.

In the FDRE constitution of Article 40(8), the government should pay compensation “commensurate to the value of the property” expropriated. In addition proclamation 455/2005 and Directive No 19/2006 declared that compensation for property is based on replacement cost of the property. The value is based on current market value, whereas most of them were not get appropriated compensation that would used in the replacement previously property. Due to this landholders were not satisfied. Mostly, low compensation amount and the inappropriate valuation system were their reason for dissatisfaction of compensation.

Table 4.14: Types of frequently complain by appealing forms

<table>
<thead>
<tr>
<th>Types of appeal</th>
<th>Expropriated frequently complain</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fully expropriated</td>
<td>Partially Expropriated</td>
</tr>
<tr>
<td>Number %</td>
<td>Number %</td>
<td>Number %</td>
</tr>
<tr>
<td>Compensation</td>
<td>1</td>
<td>4.8</td>
</tr>
<tr>
<td>Involuntarily to leave</td>
<td>3</td>
<td>14.2</td>
</tr>
<tr>
<td>Time sufficiency</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>19</td>
</tr>
</tbody>
</table>

Source: Based on Field Survey by Author.

In the study area, 52.3% were responded that most frequented complaint for road construction was partial expropriated and their appeal forms were compensation related. 19% were fully expropriated were frequently complaining, of them, 14.2% were responded that the forms of appeal were involuntary to leave the land/ area. The remaining 19% were responded that the type of frequently complain were none compensated; from which more than 9% were complaining due to compensation. Appeal form due to time sufficiency to leave the land was insignificant because of more stress on compensation.

In compensation and the expropriation issue majority were appealed to government offices and from the compliant most of them were found in the newly settled area of the ROOT school to BONO WUHA. As described above, most of them were not gain compensation because, the area was currently settled and some of them were expropriated for the second time that was expropriated from previously road construction in other sites. The expropriated were not satisfied by their respond and their final decision was keeping silent, and performs what they required to do. In addition, as data collected from officials and interview were conducted; expropriated landholders have shown unwanted acts like insulting and saying who touch my property. The district administrators and urban development and renewal office manager representative responded that some landholders were opposed expropriation.

VII. RULES AND REGULATION

The interviewed key informant in relation to rule and regulation were Urban Development and Renewal Office manager representative, Addis Ababa Road Authority, and district executive managers.

The rules they were used for expropriation and compensation were proclamation no 455/2005 and Directive 19/2006 mainly they were used directive 19/2006, which were formulated by Addis Ababa City Administration Cabinet that clarify Proclamation No 455/2005. As interview performed in the field survey directive were not fully effective because the amount of compensation were made expropriated to appeal complain. As mentioned in the directive the current amount of cost was determined by Construction Industry Development and Maintenance Authority and Finance and Economic Development Office. The unit cost is not fair and detailed but simple estimation. The other issues in relation to rule were in the two sites, especially at the site of ROOT School to BONO WUHA the landholders were currently settled and most of them were discarded from compensation. These were due to their property were not seen by GIS and did not have a building plan, which the directives were declared and neglected those landholder settled after 1997.

In Addition the directives were not considered the current Sub City development because these areas were transition zone and there were many settlers. In relation to compensation, the directive declared that compensation for expropriated should be based on current building inputs and labor cost, here the current cost were based on an annual study from Construction, Industrial Development Authority and Finance and Economic Development Bureau. But the biggest challenge was the general description cost and unfair cost given for them. These made to low compensation amount, and highly complaint from expropriated.

The issue of implementations of rule was inappropriate in the case of the Yeka Sub City level of expropriation and compensation. The first issues were time given to the expropriated and inappropriate letter description to leave the land. As the directive was declared the authority should receive land from the land holder after 30 days and the letter describes the amount that will be paid, but as described above these were not appropriately implemented. The main and big challengeable issue was inconsistent design and the shortest time given to expropriator from Road Authority.

VIII. CONCLUSIONS AND RECOMMENDATIONS

Conclusions
Modern sense of capacity building is increased human, department, institution, and customer satisfaction. Training integrates efficiency and personal satisfaction, formal planning and creativity, result/action orientation and human relationships. In Urban Development and Renewal Office training was delivered for workers, but the majority of their capacities were not built through training due to low frequency delivered to them. Training and satisfaction are directly related. Workers believed that training increased ability and customer satisfaction, and make responsible.
Expropriation and compensation for road construction needs involvement of different stakeholder. Issue of expropriation and valuation were performed by Urban Development and Renewal Office, whereas compensation and Design for roads were conducted besides Road Authority. But estimation of unit cost of labor and construction materials for compensation purpose was determined by Construction Industry Development and Maintenance Authority and Finance and Economic Development Bureau.

There are problems that faced in the work flows like inconsistent design and communication were not addressed problems in the office. The design of the road was changed more than two times. Besides of this, Implementer Authority marked on the landholder’s property without making integration to other stakeholders. The time given resulted to burden in the expropriated and expropriators to implement as the rule permits.

Road construction project sites, both fences and house were highly demolished. But the information avail for them was not on time.

Expropriated landholders were dissatisfied in the expropriation process and the number of participants was low. In these project sites avery the participants in expropriation process were more satisfied than none participants, which indicates that participation increase satisfaction of expropriated and acceptance of expropriation process.

Most of the expropriated were getting compensation, but the compensated and none compensated were proportional in number. The amount of compensation was low and the expropriated were appealed to government office, but the complaints were not satisfied.

The base of rules and regulations for expropriation was proclamation and directives. In the Yeka Sub City for expropriation and compensation the base was Directive 19/2006 and Proclamation 455/2005. The directives were not fully effective. The reason behind it ignores the settled landholders from compensation that were stayed beyond Ten years.

**Recommendations**

- The office should be built human resource capacity through training.
- The Road Authority should work to integrate with the Urban Development and Renewal Office while performing tasks like marking on the ground.
- Expropriation process should be participatory and it should not be one time worked on the committee’s selection and there should be continuous follow up and supervision.
- Awareness creation in the issue of expropriation should be delivered to landholders.
- Compensation amount should be improved and the concerned body should study the unit costs detail and price should be fair.
- As a principle of expropriation, there should be clear law, procedures and fair compensation for expropriated, but the directive left currently settled areas or built after 1997 without compensation. Therefore, the directive should be revised and consider the transitional zone.

The research recommended for further research, the need to establish an independent office that performs expropriation, valuation and compensation at one office.

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**REFERENCES**


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Proposed Performance-Based Seismic Design Method for Assessing Vulnerability and Fragility of RC Buildings

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** Professor in Department of Civil Engineering, Mandalay Technological University, The Republic of the Union of Myanmar

Abstract- The objective of this study is to develop a simplified seismic performance based design method which reduce the repetition cycles of nonlinear process. The peak ground accelerations are estimated using earthquake data along the Sagaing Fault for Mandalay city in Myanmar. The evaluated yield accelerations of twenty case studies of the seismic force resisting systems that complying with the performance objectives are documented as a data bank based on the current analysis and design procedure. Then, they are converted to a proposed yield acceleration equation using second-order polynomial regression. This method is also verified by the total of four buildings based on different number of stories. By introducing, this proposed yield acceleration at the initial stage of analysis and design as a simplified method, some repetitions of the nonlinear process can be reduced. Fragility curves are developed for performance based buildings on different peak ground accelerations and their damage probability is compared. The vulnerability of the buildings is estimated in terms of vulnerability index to assess the performance of the building.

Index Terms- A Simplified Performance-Based Seismic Design, Yield Acceleration, Second Order Polynomial Regression, Fragility curves, Vulnerability Index

I. INTRODUCTION

Performance Based Seismic Design (PBSD) has been considered as an essential part of earthquake engineering. New developments and methods for the application of PBSD methodology are needed because most existing PBSD approaches tend to provide guidance and tools for the evaluation of seismic performance of a building that has already been designed [8]. In other words, more research work is needed for development of initial design because there is no guideline provided in current PBSD practice [6]. Several approaches mainly provide a suitable design base shear that accounts for higher mode effects, system over strength, yield displacement, effective stiffness, viscous damping, effective period, or displacement ductility. Additionally, iteration during the design process is still required. Thus, practical methods based on these approaches are still under development and improvement [5]. Losses inflicted on modern buildings from recent earthquakes have shown the pressing need for investigation of the seismic safety of code-compliant buildings at various performance limit states. This need has stimulated significant research to develop methodologies for deriving fragility relationships, which are a key component in seismic loss assessment. The seismic vulnerability of a structure can be described as its susceptibility to damage by ground shaking of a given intensity. The methodologies are used to develop various tools such as vulnerability functions and fragility curves, from structural damages observed during earthquakes.

II. METHODOLOGY AND MODEL DEVELOPMENT

A. Seismic Hazard Analysis for Mandalay City Area

In considering earthquake hazard environment of Mandalay City, the probability of exceedance in 50 years is 50% for the operational earthquake level (MOE), 10% for the design basic level earthquake (DBE) and 2% for the maximum considered earthquake level (MCE) [4].

\[
T = \frac{1}{1 - (1 - p)1/n}
\]

where, \( p \) = Probability of exceedance in 50 years
\( T \) = Return period
\( n = 50 \) years
Magnitude probability for Gutenberg-Richter law of Equation as follows [1].

\[
F_M(m) = \frac{1 - 10^{-b(M - M_{\text{min}})}}{1 - 10^{-b(M_{\text{max}} - M_{\text{min}})}}
\]

Where \( M_{\text{max}} \) the maximum and \( M_{\text{min}} \) the minimum earthquakes.

\[
P(M = m_j) = F_M(m_{j+1}) - F_M(m_j)
\]

Where \( m_j \) are the discrete set of magnitudes, ordered so that \( m_{j+1} < m_j \).

Estimation of peak ground acceleration is based on earthquake data from the Sagaing Fault [2].

\[
\text{Ln (PGA)} = -0.152 + 0.859 Mw - 1.803 \text{ln(R + 25)}
\]

where, PGA = Peak ground acceleration
\( Mw \) = Moment magnitude
\( R \) = Source Distance

<table>
<thead>
<tr>
<th>Earthquake Type</th>
<th>SE</th>
<th>DBE</th>
<th>MCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return Period</td>
<td>72</td>
<td>475</td>
<td>2475</td>
</tr>
<tr>
<td>Moment magnitude</td>
<td>6.5</td>
<td>7.325</td>
<td>7.875</td>
</tr>
<tr>
<td>Acceleration at the base rock (g)</td>
<td>0.166</td>
<td>0.331</td>
<td>0.508</td>
</tr>
<tr>
<td>Amplification (Cg)</td>
<td>1.2</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Acceleration at the</td>
<td>0.2</td>
<td>0.4</td>
<td>0.6</td>
</tr>
</tbody>
</table>


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ground surface \((g)\)

### B. Performance Criteria

**TABLE II**

<table>
<thead>
<tr>
<th>Seismic Hazard Level</th>
<th>Performance Level</th>
<th>Probability/year</th>
<th>Critical Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE</td>
<td>IO</td>
<td>50%/50yr</td>
<td>1%</td>
</tr>
<tr>
<td>DBE</td>
<td>LS</td>
<td>10%/50yr</td>
<td>2%</td>
</tr>
<tr>
<td>MCE</td>
<td>CP</td>
<td>2%/50yr</td>
<td>4%</td>
</tr>
</tbody>
</table>

### C. Description of General Design Process

This flow chart shows that the key steps in the performance based design process. It is an iterative process that begins with the selection of structural members, followed by the development of a preliminary design, an assessment as to whether or not the design meets the performance objectives, and finally redesign and reassessment, if required, until the desired performance level is achieved [7].

![Flow Chart](image)

### D. Case Study for Building Configurations

The present research is a study of nonlinear behaviors of irregular concrete framed buildings which are divided into four groups based on bay spans and length to width ratios. Each group consists of five case studies and total of twenty case studies are considered. The dimensions of buildings for case studies included are shown in Table III.

**TABLE III**

<table>
<thead>
<tr>
<th>Case</th>
<th>L/B</th>
<th>L (ft)</th>
<th>B (ft)</th>
<th>H (ft)</th>
<th>No of Storey</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.25</td>
<td>100</td>
<td>80</td>
<td>11</td>
<td>3,5,7,9,12</td>
</tr>
<tr>
<td>2</td>
<td>1.5</td>
<td>120</td>
<td>80</td>
<td>11</td>
<td>3,5,7,9,12</td>
</tr>
</tbody>
</table>

### E. Performance Based Seismic Design Of RC Buildings

The reinforced concrete buildings are designed as on performance based seismic design procedure. Analytical results such as hinge formation maximum considered earthquake are shown from Fig. 2.

![Fig.2 Summary of Case Studies](image)

### F. Evaluated Yield Acceleration, \(S_{\text{ay}}\)

The Evaluated \(S_{\text{ay}}\) for Four Group based on performance based seismic design of RC building. The minimum requirements of \(S_{\text{ay}}\) for Immediate Occupancy are shown in Table IV.

**TABLE IV**

<table>
<thead>
<tr>
<th>No. of Storey</th>
<th>3</th>
<th>5</th>
<th>7</th>
<th>9</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>(T)</td>
<td>0.413</td>
<td>0.606</td>
<td>0.78</td>
<td>0.942</td>
<td>1.168</td>
</tr>
<tr>
<td>(S_{\text{ay}}) for Group 1</td>
<td>0.672</td>
<td>0.475</td>
<td>0.431</td>
<td>0.348</td>
<td>0.283</td>
</tr>
<tr>
<td>(S_{\text{ay}}) for Group 2</td>
<td>0.67</td>
<td>0.467</td>
<td>0.384</td>
<td>0.339</td>
<td>0.272</td>
</tr>
<tr>
<td>(S_{\text{ay}}) for Group 3</td>
<td>0.658</td>
<td>0.461</td>
<td>0.375</td>
<td>0.332</td>
<td>0.251</td>
</tr>
<tr>
<td>(S_{\text{ay}}) for Group 4</td>
<td>0.656</td>
<td>0.457</td>
<td>0.373</td>
<td>0.323</td>
<td>0.249</td>
</tr>
<tr>
<td>Average (S_{\text{ay}})</td>
<td>0.664</td>
<td>0.465</td>
<td>0.391</td>
<td>0.334</td>
<td>0.263</td>
</tr>
</tbody>
</table>

The average \(S_{\text{ay}}\) and time period \(T\) are considered as a proposed yield acceleration for the proposed design method.

### G. Proposed Yield Acceleration, \(S_{\text{ayT}}\)

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In this study, the $S_{ayT}$ are indicated in term of the fundamental periods of buildings. Equations are derived using second-order polynomial regression based on the average evaluated yield acceleration. The second-order polynomial regression is shown in Equation 5.

$$S_{ayT} = a_0 + a_1T + a_2T^2$$  \tag{5}

where, $S_{ayT}$ = proposed yield acceleration

$T$ = fundamental period

$a_0$, $a_1$, and $a_2$ = coefficients

The coefficients can be determined by using the following set of equations.

$$\begin{align*} 
(n)a_0 + \left( \sum_{i=1}^{n} T_i \right) a_1 + \left( \sum_{i=1}^{n} T_i^2 \right) a_2 &= \sum_{i=1}^{n} S_{ayT_i} \\
\left( \sum_{i=1}^{n} T_i \right) a_0 + \left( \sum_{i=1}^{n} T_i^2 \right) a_1 + \left( \sum_{i=1}^{n} T_i^3 \right) a_2 &= \sum_{i=1}^{n} T_i S_{ayT_i} \\
\left( \sum_{i=1}^{n} T_i^2 \right) a_0 + \left( \sum_{i=1}^{n} T_i^3 \right) a_1 + \left( \sum_{i=1}^{n} T_i^4 \right) a_2 &= \sum_{i=1}^{n} T_i^2 S_{ayT_i} 
\end{align*}$$

where, $n$= number of set of data

J. The Proposed Simplified Seismic Design Method

A proposed simplified seismic design method using $S_{ayT}$ is shown in Figure 4. The $S_{ayT}$ from the proposed Equation 6 is used in this method.

K. Algorithm of Proposed Seismic Method

1. Checking of design condition and obtaining the design requirement are required. Then, the structural model is developed.

2. Estimation of the base shear using $R$ factor according to the UBC-97 and analysing of the model are included. Then the member design is done based on moment, shear, and axial force from the analysis and the $S_{ay}$ is calculated. The required data for this equation can be obtained from the analysis.

3. Checking of the $S_{ay}$ with the $S_{ayT}$ from the proposed Equation 6 is required. If they are not nearly equal, go to the step-2 to determine new structural member set by adjusting $R$ factor for the based shear. Then calculation of $S_{ayT}$ and comparison with the $S_{ayT}$ is done until they are almost equal.

4. The pushover analysis was done to check the three limit states such as IO, LS, and CP.

5. To check the IO level, the minimum required $S_{ay}$ from the performance point at under SE is obtained and with the evaluated $S_{ay}$ calculated from the step-3 is compared. To check the LS and CP levels, the story drifts are calculated using the structural deformations under DBE and MCE. Then, they are compared with the maximum drift limitations. If one of the three limit states check is not acceptable, it is required to repeat the step-4 by increasing stiffness to upgrade yield acceleration until they are acceptable.

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L. Range of Applicability
1. Special concrete moment resisting frame with fundamental period $0.413 \leq T \leq 1.168$ seconds.
2. Irregular structure located in seismic zone 4.
3. The L/B ratio must be between 1.25 to 2.

III. Verification
The four verification examples are considered according to various number of stories and plans.

A. Verification for Different Numbers of Storey
The geometries of the selected buildings are shown from Figure 5, 7, 9 and 11. Analytical results such as hinge formation, performance point at the maximum considered earthquake are shown from Figure 6, 8, 10 and 12.

Verification Example 1, (135’x85’x55’), L/B=1.59

Verification Example 2, (114’x72’x77’), L/B=1.58

Verification Example 3, (115’x70’x99’), L/B=1.64

Verification Example 4, (114’x87’x121’), L/B=1.31
The performance level of structure in Maximum Considered Earthquake is shown in Fig. 12. This spectrum curve points out the performance point at Life Safety level, the spectral acceleration 0.344g and spectral displacement 12.564in. It is occurred between step 12 and 13.

B. Summary of Analytical Results for Different Number of Storey

The evaluated $S_{ay}$ based on the analytical results of each case study are shown in Table V. The minimum requirements of for IO and maximum interstory drift limitations for LS and CP are also checked.

In summary, the number of repetitions required for the simplified method is less than that of using the general procedure. In addition, L/B ratio is small effect on the proposed method as long as the building is irregular.

D. Seismic Vulnerability Assessment of Verification Examples

The vulnerability index is a measure of the damage in a building obtained from the pushover analysis. It is defined as a scaled linear combination (weighted average) of performance measures of the hinges in the components, and is calculated from the performance levels of the components at the performance point or at the point of termination of the pushover analysis. The vulnerability index of a building is assessed with the expression as follows [9].

$$V_{i}^{bldg} = \frac{1.5 \sum_{i}^{N_{c}} N_{i}^{c} x_{i} + \sum_{j}^{N_{b}} N_{j}^{b} x_{j}}{\sum_{i}^{N_{c}} N_{i}^{c} + \sum_{j}^{N_{b}} N_{j}^{b}}$$

(8)

Where $N_{c}^{i}$ and $N_{b}^{j}$ are the numbers of hinges in columns and beams, respectively, for the $i^{th}$ and $j^{th}$ performance range. A weightage factor ($x_{i}$) is assigned for columns and ($x_{j}$) is assigned for beams to each performance range, the weightage factor is shown in Table VII.

$V_{bldg}$ is a measure of the overall vulnerability of the building. A high value of $V_{bldg}$ reflects poor performance of the building. However, this index may not reflect a soft storey mechanism.

The four verification examples for different numbers of storey are selected. They are irregular buildings with L/B ratios between 1.3 and 1.64. From the results, it is concluded that the Proposed $S_{ay}$/Evaluated $S_{ay}$ ratio must be between 0.9 to 1.

C. Comparison of Repetition Cycles for Different Numbers of Storey

As a result, it is found that the number of repetitions required for the analysis and design process to satisfy the three limit states are five times for Four storeyed building, six times for the Six and Eight storeyed buildings, and eight times for Ten storeyed building when the general design procedure is used.

However, when the simplified approach is used, the repetitions are decreased to one time for Four, Six and Eight storeyed buildings, and two times for the Ten storeyed building. The comparison of required numbers of repetition for the both methods is shown in Fig. 13.
A storey vulnerability index (VI$_{storey}$) defined to quantify the possibility of a soft/weak storey with the formation of flexural hinges. For each storey, VI$_{storey}$ is defined as

$$VI_{storey} = \frac{\sum x_i}{c}$$  \hspace{1cm} (9)

A Storey Vulnerability Index based on Maximum Considered Earthquake (Verification Example I)

From the results, it is found that, the storey 3 are more vulnerable than other storey. The value of storey vulnerability index are different due to their configurations.

A Storey Vulnerability Index based on Maximum Considered Earthquake (Verification Example II)

From this table it is apparent that, storey 5 are more vulnerable than other storey.

A Storey Vulnerability Index based on Maximum Considered Earthquake (Verification Example III)

The storey vulnerability index of zero indicate that most of the hinges are formed in beams rather than in columns.

A Storey Vulnerability Index based on Maximum Considered Earthquake (Verification Example IV)

From this table, the storey vulnerability index of zero indicate that most of the hinges are formed in beams rather than in columns. These are strong column and weak beam design.

<table>
<thead>
<tr>
<th>Building</th>
<th>Vulnerability Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-storey</td>
<td>0.36</td>
</tr>
<tr>
<td>6-storey</td>
<td>0.356</td>
</tr>
<tr>
<td>8-storey</td>
<td>0.313</td>
</tr>
<tr>
<td>10-storey</td>
<td>0.334</td>
</tr>
</tbody>
</table>

V$_{V_{bldg}}$ is a measure of the overall vulnerability of the building. A high value of V$_{V_{bldg}}$ reflects poor performance of the building. From this table it is apparent that, the buildings (Verification Examples III and IV) are more resistant than Verification Examples I and II under DBE and MCE.

E. Seismic Fragility Analysis of Verification Examples

Fragility curves describe the probability of damage to building. Building fragility curves are lognormal functions that describe the probability of reaching, or exceeding, structural and non-structural damage states, given median estimates of spectral response, for example spectral displacement. These curves take into account the variability and uncertainty associated with capacity curve properties, damage states and ground shaking.

Evaluation of Structural Fragilities [10]

$$P[ds/S_a] = \Phi[(1/\beta_{ds}) \ln(S_a/S_{a,ds})]$$  \hspace{1cm} (10)

Where,

- $P[ds/S_a]$ = damage probability value, $ds$
- $S_{a,ds}$ = Median value of spectral acceleration at which the building reaches the threshold of damage state, $ds$
- $\beta_{ds}$ = Standard deviation of the natural logarithm of spectral acceleration for damage state, $ds$
- $\Phi$ = Standard normal cumulative distribution function.
- $S_a$ = Given peak spectral acceleration

Fragility Curve for Verification Example I
If the spectral acceleration 0.746g (PGA = 0.6g) corresponding to a return period of 2475 years, the probabilities of slight, moderate and severe damage to the Verification Example I is 97%, 77% and 45% respectively.

**Fragility Curve for Verification Example II**

If the spectral acceleration 0.588g (PGA = 0.6g) corresponding to a return period of 2475 years, the probabilities of slight, moderate and severe damage to the Verification Example II is 98%, 89% and 36% respectively.

**Fragility Curve for Verification Example III**

If the spectral acceleration 0.366g (PGA = 0.6g) corresponding to a return period of 2475 years, the probabilities of slight, moderate and severe damage to the Verification Example III is 98%, 91% and 22% respectively.

**Fragility Curve for Verification Example IV**

If the spectral acceleration 0.352g (PGA = 0.6g) corresponding to a return period of 2475 years, the probabilities of slight, moderate and severe damage to the Verification Example IV is 99%, 85% and 30% respectively. This table shows the probability of damage for SE(0.2g), DBE(0.4g) and MCE(0.6g).

**IV. CONCLUSIONS**

In this study, the proposed yield acceleration $S_{ayT}$ or $V_y$ that satisfy the basic safety objectives including acceptable story drift limits for LS, CP and minimum required $S_{ay}$ for IO. Therefore, the yield acceleration $S_{ay}$ is evaluated for concrete moment frames based on the total of twenty case studies. The yield acceleration, $S_{ay}$ decreases substantially with increased building height. The proposed simplified seismic performance based design method is developed by using evaluated yield acceleration, $S_{ayT}$. The repetition cycles of nonlinear analysis and design process can be reduced by using the proposed method.

A storey vulnerability index of zero indicates that most of the hinges are formed in beams rather than in columns. These are strong column and weak beam design. The yield mechanisms adopted in earthquake resistant design are strong column and weak beam. These buildings (Verification Examples III and IV) are more resistant than Verification Examples I and II under DBE and MCE.

The Fragility Curve are plotted considering Spectral Acceleration as a ground motion parameter. Fragility curves were developed for performance based seismic design of RC buildings and compared their damage states. It is observed that verification example III is seismically more resistant than other verification examples for severe damage states.

**ACKNOWLEDGMENT**

I would like to express heartfelt gratitude to Dr. Nilar Aye Professor and Head of Civil Engineering Department and all of my teachers at Mandalay Technological University for their encouragement and suggestions.

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AUTHORS

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The effects of pregnancy on pulmonary function and respiratory muscles power parameters in Sudanese women.

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\textsuperscript{2}-Obstetrics and Gynecology consultant, The National Ribat University Hospital, Khartoum, Sudan
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Abstract- Background: Pregnancy has many effects on the functions of women body systems. It is known that the respiratory rate of pregnant women increases as early as the first trimester. The aim of this study is to investigate the effects of pregnancy (2nd and 3rd trimesters) on lung function parameters (FVC, FEV\textsubscript{1} and PEFR) and respiratory muscles power parameters (MIP and MEP) in Sudanese women from Khartoum state.

Methods: A cross sectional descriptive study was carried out on fifteen normal pregnant women. Pulmonary function tests were performed by a microplus spirometer for measurement of FVC, FEV\textsubscript{1} and PEFR, which were compared with the normal Sudanese predicted values. Respiratory muscles power was measured by using Respiratory Pressure Meter (RPM) by measuring the maximum expiratory pressure (MEP) and the maximum inspiratory pressure (MIP). The results were compared with eight normal women of the same age and height.

Results: The study showed significant decrease of pulmonary function test parameters (FCV, FEV\textsubscript{1}) and inspiratory muscles power (MIP).

Conclusion: decreased pulmonary function parameter in pregnancy could be explained by decreased respiratory muscles power.

Index Terms- Pregnancy. Pulmonary function. Respiratory muscles power.

I. INTRODUCTION

In pregnancy, hormonal changes and the progressive increase in abdominal volume may have mechanical and chemical impact on respiratory function. However, an increased transverse diameter of the chest, resulting from a widened sub costal angle, opposes the effect of the enlarging pregnant uterus and elevated diaphragm, leaving pulmonary function altered but not compromised, during pregnancy.\textsuperscript{11} The anatomical, physiological and biochemical adaptation to pregnancy are profound. The change in a pregnant woman is in response to maternal adaptation to an increasing demand of growing fetus. Maternal pulmonary functions in pregnancy are changing because of multiple reasons like progressive enlargement of uterus, increase in progesterone, increase in blood flow and volume. These changes are said to be mediated mainly by progesterone rather than estrogens, that increase respiratory oxygen consumption.\textsuperscript{2,3} Prostaglandins stimulate uterine smooth muscle during labor and are present during all trimesters of pregnancy. Prostaglandin F\textsubscript{α} increases airway resistance by bronchial smooth muscle constriction, whereas a bronchodilator effect can be a consequence of prostaglandins E and E\textsubscript{2}.\textsuperscript{4}

Others showed that the PFTs parameters are normal in the first trimester but there was significant decrease in them in the second and third trimesters,\textsuperscript{5,6,7,8} or in the third trimester only,\textsuperscript{9,10} or unchanged.\textsuperscript{11} Andrea lemos et al found that respiratory muscles power during different trimesters were not affected.\textsuperscript{12} In a previous study in Gezira/Sudan both PFTs parameters and respiratory muscles power were found to be decreased.\textsuperscript{13} This study aimed at investigating the effect of pregnancy on respiratory muscles power and pulmonary function test (PFTs) in Sudanese women from Khartoum state in the second and third trimesters.

II. METHODS

This is a cross-sectional descriptive study conducted during June and July 2016 in the National Ribat University Hospital, in Khartoum state. It included 15 pregnant women in the second and third trimesters selected randomly from antenatal outpatient clinic of Omer Sawi clinics collection. Healthy pregnant women were included and those with twins pregnancy or illness were excluded. The control group were female students and workers from the faculty of medicine the National Ribat University in the same range of age and height.

Ethical clearance has been obtained from the National Ribat University and consent from the participants. All selected subjects were interviewed to fill a questionnaire including information about personal data, clinical history (past and present history of any disease), physical activity and gravidity. Data was collected in data collection sheet. A digital Spirometer was used for PFT. Height was measured standing and without shoes by a tape mounted on a wall nearest to 0.5 cm and weight was recorded without shoes on a sensitive weighing balance to the nearest 500 g. The subject was asked to relax for 5 minutes, prior

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to performing the pulmonary function test by the spirometer which shows the forced vital capacity (FVC), the forced expiratory volume in one second (FEV1) and the peak expiratory flow rate (PEFR). The test was demonstrated to the subject. The subject was asked to take a deep maximal inspiration and exhale strongly, rapidly and completely into the mouth piece. All tests were recorded 3 times and out of them the best results were taken. The results were compared with the Sudanese predicted values for sex, age and height. Respiratory muscles power was measured by Respiratory pressure meter (micro RPM). The measurement started by asking the subject to sit down on arm chair. The subject was instructed to insert mouth piece into her mouth ensuring that the flange was positioned over the gum and inside the lips and that the bite blocks is between the teeth. The subject should then inhale to total lung capacity (TLC) and then exhale as much as effort as possible through the controlled leak of the meter at least 3 seconds. It measures maximum expiratory pressure (MEP). The reading displayed is maximum average expiratory pressure over 1 second. The maximum inspiratory effort was conducted by asking the subject to expire the residual volume (RV) and then perform a maximum inspiratory maneuver. An acceptable maneuver was defined as one that showed a 3-s plateau of inspiratory effort, and it measures maximum inspiratory pressure (MIP). The mouthpiece was protected from contamination by immersion in Clorox solution and alcohol 20%. Rinsed with distilled water, drained and allowed to dry before re assembly. The results of pregnant women were compared with matching control. Results obtained were analyzed using the statistical package for social sciences (SPSS). version 21.0. Data were expressed as means with standard deviation (SD). P≤0.05 was considered statistically significant.

### III. RESULTS

The study was carried out on fifteen normal pregnant women, six in the second trimester and nine in the third trimester and the values were compared with Sudanese female predicted normal values for PFTs. Eight non pregnant women were taken as control for respiratory muscles power. The lung function tests measurement as mean ±SD were taken and were found significantly lower than the normal predicted values for all the table (1). The lung function measurements for pregnant women in the second trimester were significantly lower for FVC, FEV1 but not for PEFR table (2). Although all of these values were significantly lower in the third trimester table (3). The respiratory muscles power test were maximum inspiratory pressure (MIP)=43.47±23.817 cmH2O, 72±18.921 cmH2O, maximum expiratory pressure (MEP)=68.18±22.627 cmH2O, 76.00±11.952 cmH2O, for pregnant women and control respectively. (Fig 1). There was significant difference in MIP but not for MEP. There was no significant difference in respiratory muscles values between the trimesters (MIP=34.0±24.282 cmH2O, 49.78±22.632 cmH2O, MEP=66.17±24.555 cmH2O, 69.44±22.678 cmH2O) for the second trimester and the third trimester respectively. (fig 2).

#### Table (1) PFTs of pregnant women and their predicted normal values.

<table>
<thead>
<tr>
<th></th>
<th>Pregnant women(n=15)</th>
<th>Predicted normal value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FVC (L)</td>
<td>2.4013±0.39509</td>
<td>2.9427±0.12798</td>
<td>.000</td>
</tr>
<tr>
<td>FEV1(L)</td>
<td>2.3087±0.33483</td>
<td>2.7600±0.09681</td>
<td>.000</td>
</tr>
<tr>
<td>PEFR (L/min)</td>
<td>309.20±64.335</td>
<td>357.53±10.822</td>
<td>.008</td>
</tr>
</tbody>
</table>

#### Table (2) PFTs of second trimester pregnant women and their predicted normal values.

<table>
<thead>
<tr>
<th></th>
<th>2nd trimester(n=6)</th>
<th>Predicted normal values</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FVC (L)</td>
<td>2.3017±0.51047</td>
<td>2.9033±0.14828</td>
<td>0.020</td>
</tr>
<tr>
<td>FEV1 (L)</td>
<td>2.2050±0.44559</td>
<td>2.7467±0.09812</td>
<td>0.016</td>
</tr>
</tbody>
</table>
Table (3) PFTs of third trimester pregnant women and their predicted normal values.

<table>
<thead>
<tr>
<th></th>
<th>3rd trimester(n=9)</th>
<th>Predicted normal values</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FVC (L)</td>
<td>2.4678±0.31288</td>
<td>2.9689±0.11396</td>
<td>.000</td>
</tr>
<tr>
<td>FEV1(L)</td>
<td>2.3778±0.24222</td>
<td>2.7689±0.10080</td>
<td>.000</td>
</tr>
<tr>
<td>PEFR (L/min)</td>
<td>307.33±59.869</td>
<td>359.22±12.296</td>
<td>.022</td>
</tr>
</tbody>
</table>

Figure(1) MIP and MEP in cmH₂O for pregnant women and control.

Figure(2) MIP and MEP in cmH₂O for 2nd and 3rd trimesters.
IV. DISCUSSION

The physiological changes during pregnancy affect all body systems and respiratory system shows increased respiration as early as the first trimester although some studies had shown no change in lung function during pregnancy. This study showed significant decrease in lung function parameters (FVC and FEV1) in both second and third trimesters, and significant decrease in PEFR in the third trimester only (Tables1-2). Recently PEFR has been reported to decrease progressively from first to third trimester which has been attributed to a lesser force of contraction and restricted movement of respiratory muscles. The pulmonary function values difference between sexes has been explained by the difference in respiratory muscles power, and that for pregnant ladies has been controversial. This study has shown a significant decrease in MIP in pregnancy. This can explain the changes in PFT parameters in pregnancy but it needs further documentation during the whole periods of pregnancy. In conclusion PFT parameters decrease during pregnancy and it might be explained by decreased respiratory muscles power and that needs more studies.

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AUTHORS

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Occupational asthma in Sudan

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Abstract- Objectives: this study is designed to assess the effect of occupational exposure on respiratory symptoms and pulmonary functions of workers in Sudanese factories.

Methods: A cross sectional study was performed in four Sudanese factories, in Khartoum and Eight hundred and six workers from different factories were included, 319 workers from Khartoum refinery company, Khartoum state, 232 workers from Al Genaid sugar factory, 152 workers from Al Baraka biscuit manufacturing factory and 103 workers from Gezira tannery, Gezira state. Respiratory symptoms, pulmonary function and skin prick tests were evaluated.

Results: asthma symptoms have increased significantly after occupational exposure in all studied factories. Biscuit factory and Khartoum Refinery Company showed the highest asthma symptoms (35.5% and 31.3% respectively). FVC and FEV1 were found to be most affected by exposure. The sensitivity to different allergens in relation to subjects with abnormal pulmonary function was found to be very high in the refinery, 93%. Improper use of masks did not protect the workers.

Conclusion: Occupational asthma symptoms increase in workers in the tannery, biscuit, sugar factories and refinery company in Sudan with pulmonary functions deterioration.

Index Terms- occupational asthma, Sudan, lung function tests

I. INTRODUCTION

In recent years, the prevalence of work-related asthma has increased; therefore, more attention needs to be paid to occupational allergens and their avoidance and control in workplaces. The prevalence of asthma in Sudan is 12.5 % in children according to ISAAC study phase three. In Sudan few studies have investigated this effect in relation to benzene fumes, bakeries and cotton milling. Asthma symptoms related to refining processes, sugar cane refining, tannery industry and flour exposure in biscuit factories needs further investigation.

The petroleum refining process was found to be significantly associated with respiratory symptoms. Bashir and Musa in Khartoum state, Sudan found a significant reduction in FVC and FEV1 as a result of chronic exposure to benzene. The decrease in FVC values was directly proportional to the duration of exposure. On the other hand different studies have confirmed the hazardous effects of sugar cane refining on the respiratory system. In Sudan, no previous studies have investigated these parameters.

Many studies have shown that flour dust exposure causes respiratory symptoms and is associated with impairment of lung function. In sudan Ahmed et al found that working at the bakeries for three years or more significantly lower FEV1 and FVC and increases respiratory symptoms.

Long-term exposure to solvents and chromium compounds in tannery factories had adverse effects on respiratory systems in tannery workers. Health status was studied in tannery factories in India and showed that nearly 46% of all workers had impairment suggestive of mild to moderate obstruction. About 5% of the workers had severe restriction. Varying prevalence of asthma (2.2% and 38%) among leather tannery workers in India has been reported previously.

This study aimed at whether occupational exposures during petroleum refining, leather processing, sugar refining and biscuit manufacturing processes in Sudan affect the pulmonary function through studying asthma symptoms prevalence, pulmonary function testing and skin prick testing for hypersensitivity to common allergens.

II. METHODS

A cross sectional study was conducted between June 2007 and January 2010. Ethical clearance was approved by the ethical committee of the faculty of medicine, university of Gezira. Eight hundred and six workers from different factories were included, 319 workers from Khartoum refinery company, Khartoum state, 232 workers from Al Genaid sugar factory, Gezira state, 152 workers from Al Baraka biscuit manufacturing factory, Gezira state and 103 workers from Gezira tannery, Gezira state. Both sexes and all age groups were included. Any worker with heart diseases, chest pain or with recent abdominal or thoracic surgery was excluded. Questionnaires were filled out by all participants. Weight in kilograms and height in centimeters were measured using a stadiometer. Pulmonary function tests using a spirometer (for measurement of FVC, FEV1 and percent of FEV1 to FVC) and peak flow meter (for measurement of PEF) were performed for all participants. Three trials were done and the best reading was taken as indicative of individual highest ability. The best measurement from each subject test was compared with standard predicted value from pulmonary function reference values of normal Sudanese. Reversibility test to inhaled salbutamol and sensitivity to different common allergens were performed to participants with abnormal pulmonary function tests measurements compared to predicted.

III. RESULTS

The study revealed that asthma symptoms have increased significantly after occupational exposure in all studied factories (p<0.05). Biscuit factory and Khartoum Refinery Company showed the highest asthma symptoms after occupational exposure 35.5% and 31.3% respectively then the tannery 20.4% and sugar factory 17.9% (fig 1).
The results of our study showed that there was pulmonary function deterioration in all factories as both FEV1 and FVC were found to be decreased in all factories except for the tannery where only FVC was found to be decreased. The deterioration was found to be significant in the refinery and the biscuit factory (table 1).

The sensitivity to different allergens in relation to subjects with abnormal pulmonary function was found to be very high in the refinery 93%, followed by biscuit 43.8%, tannery 28.6% and sugar 26.1%. Whereas reversibility test in relation to subjects with abnormal pulmonary function was found to be positive as follows: 57.1%, 50%, 43.5% and 25% for the tannery, biscuit, sugar and refinery company respectively (table 2).

Refinery workers were well educated as most of them have university degrees, whereas most of sugarcane workers, al Baraka biscuit workers and the tannery workers were of higher school, secondary and primary school level. Wearing masks did not protect from asthma symptoms in three factories. In refinery wearing masks decreases asthma symptoms (fig 2).

Table 1: Percent of pulmonary function deterioration compared to predicted values:

<table>
<thead>
<tr>
<th></th>
<th>Refinery</th>
<th>Sugar</th>
<th>Biscuit</th>
<th>Tannery</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEV1 Liter</td>
<td>-12.5%</td>
<td>-0.3%</td>
<td>-8.7%</td>
<td>0.9%</td>
</tr>
<tr>
<td>FVC Liter</td>
<td>-19.1%</td>
<td>-6.3%</td>
<td>-30.8%</td>
<td>-1.8%</td>
</tr>
<tr>
<td>PEFR L/min</td>
<td>-0.3%</td>
<td>10.8%</td>
<td>1.2%</td>
<td>1%</td>
</tr>
</tbody>
</table>

Table 2: Skin prick test and reversibility in relation to subjects with abnormal pulmonary function:

<table>
<thead>
<tr>
<th></th>
<th>Refinery</th>
<th>Sugar</th>
<th>Biscuit</th>
<th>Tannery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asthma symptoms</td>
<td>31.40%</td>
<td>17.90%</td>
<td>35.50%</td>
<td>20.40%</td>
</tr>
<tr>
<td>Abnormal pulmonary function test</td>
<td>13.80%</td>
<td>10%</td>
<td>10.50%</td>
<td>13.60%</td>
</tr>
<tr>
<td>Positive Skin prick test</td>
<td>93%</td>
<td>26.10%</td>
<td>43.80%</td>
<td>28.60%</td>
</tr>
</tbody>
</table>
IV. DISCUSSION

It is logic to find ventilatory deterioration in all factories as for sure the environment in the factories is more contaminated than the general environment due to the presence of different pollutants. It is also not surprising to find that refinery workers have the highest ventilatory deterioration as it is highly polluted. Biscuit workers were also found with high ventilatory deterioration and this may be due to the strong allergenic properties of flour. Tannery was found with the lowest ventilatory deterioration, and this is due to good ventilation in the factory.

As many substances in the workplace can cause occupational asthma, it’s not surprising to find that asthma symptoms increased in all factories compared to the general population. The lowest asthma symptoms in our results (17.9% in sugar factory) were found to be more than what found by Musa et al (2008) in the general population (9%)\textsuperscript{21}. It is logic to find that the biscuit factory has the highest asthma symptoms due to the strong allergenic properties of flour\textsuperscript{22} that make bakers at higher risk of occupational asthma. Many studies have shown that flour dust exposure causes respiratory symptoms and is associated with impairment of lung function\textsuperscript{11,12,13,14}. Refinery was also found with high asthma symptoms and this is because of the higher and different contaminants that refineries release and for this reason many governments put restrictions on the place of the refinery building which is usually far away from people inhabitants.

The sensitivity of the workers of the refinery to the different common allergens was found to be very high (93%). Flour is known allergen so the skin prick test was found to be also high in the biscuit factory (43.8%). If the allergen used was the specific allergen for each factory the sensitivity would have been higher than what we have found, and the cost and availability of specific allergens hindered their use.

Using masks was found to be effective in protecting from asthma symptoms in refinery but not effective in sugar, biscuit and tannery and this may be due to the high level of education in refinery workers that makes the workers use the masks more properly than non educated subjects.

It is concluded that occupational exposure increases asthma symptoms and deteriorates pulmonary function among Sudanese factories workers. So we recommend that pulmonary function tests should be a prerequisite for employing workers in factories and then regularly performed to detect early deterioration in respiratory function. Occupational health departments should follow the national criteria of safety and ascertain its application through regular monitoring. Masks should be available in these factories and a strict rule for wearing them is recommended.
Strong attention should be paid to working conditions in the Sudanese factories. Annual environmental survey by occupational health specialists should be performed to detect all types of pollution and hazards in work environment so as to control them.

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**AUTHORS**

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Association between Selected Financial Factors and Members’ Patronage to Sacco Products in Kenya

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Abstract- In Kenya, Savings and Credit Co-operative Societies (SACCOs) contributes about 30% of the country’s gross domestic product. However, the growth of SACCOs has recently been threatened by competition by other financial institutions offering alternative services. The purpose of this study was to; establish the influence of interest rates on loyalty of SACCO members; determine the influence of the mode of disbursement of funds on loyalty of SACCO member; to determine the influence of variety of SACCO products on loyalty of SACCO member and to determine the influence of collateral required by SACCOs to SACCO products by SACCO members in the selected SACCOs. The target population was 441 members from which a sample of 209 members was selected using systematic sampling technique. Data was collected using Self-administered questionnaires. Data was analyzed by use of correlation analysis and regression analysis. The finding revealed a relationship between loyalty of members to their SACCOs interest rates (r=−0.849, p<0.01), mode of disbursement (r=0.756, p<0.01) and variety of products (r=0.310; p<0.05). The study concluded that interest rates, mode of disbursement and variety of financial products are most important financial factors which influence SACCO members’ loyalty. The study recommends that SACCOs seeking to enhance retention of their members should fasten in providing competitive interest rates and find modalities of improving their efficiency in disbursements of funds.

Index Terms- Financial Factors, SACCOs, Member Loyalty

I. INTRODUCTION

Savings and Credit Co-operative Societies (SACCO’s) are started with a common objective which is savings mobilization and credit advancement. SACCO’s encounter challenges in promoting quality financial management practices in Kenya such as limited capital, sources of funds, credit risks management and negative cash liquidity, poor governance and very low credit accessibility. A national survey conducted by Central bank of Kenya on financial access revealed that SACCO’s credit accessibility has reduced from 2009 to 2013 despite the increase in credit demand (Karanja, Wachira, Lyria, 2015).

In 1992 the Ministry issued legislation vide Commissioner’s circular that transformed the UBS which were hitherto sections of Unions into autonomous Rural SACCOs. By then there were about 15 of them with deposits of over KShs. 3.5 billion. By 1973, employees’ particularly public servants had SACCO societies registered to cater for their financial needs. These become known as Urban SACCOs as opposed to the previous Rural SACCOs. When the Co-operative sector was liberalized in 1997, Co-operatives started venturing into service provision that were previously offered by banks. This included cheques discounting, savings and fixed accounts and serving as salary pay points.

The report by SACCO Society Regulation authority (SASRA) evaluates the performance of the SACCO subsector based on the financial data and information extracted from audited financial statements and reports for the period 2006 to 2010. It is a legal requirement that the audited accounts of a SACCO society be registered with the Commissioner for Cooperatives Development before presentation to members at the annual general meeting. However, not all active SACCO societies comply with this requirement (SASRA Report, 2012).

The Vision 2030 strategy among other things requires the financial services sector to play a critical role in mobilizing the savings and investments for development of the country by providing better intermediate between savings and investments than at present. This sector will assist the mobilization of investment funds required to implement the projects of Vision 2030. SACCOs are among the financial services strategies to be implemented in this exercise. Service provided by savings and credit cooperative organizations (SACCOs) and other major financial institutions will play a crucial role in improving the reach and access of financial services (currently only 19% of Kenyans have access to formal financial services). It is notable that the financial services contribute about 4 per cent to GDP and its assets contribute equivalent to about 40 per cent of GDP (Olando, Jagongo & Mbewa (2013).

Daniel and Josphine (2013), while working on a study investigating the factors leading to SACCO members seeking services from other financial institutions, established that the choice of financial service providers was positively and significantly influenced by types of financial products, mode of disbursement of funds, staff performance, promotion strategies but negatively correlated with physical evidence and processing time of loan applications. The study revealed that other financial service providers offered more types of products than SACCOs. The SACCOs need to determine customers’ requirements in order to come up with products that make them competitive.

Karanjaet al. (2015) carried on a study to assess the influence of collateral requirements on credit accessibility of SACCO’s in Imenti North Sub-County, Kenya. The target population of the study was 34 registered SACCO’s which offers credit and the management employees were the study...

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respondents. Results of their study revealed that collateral requirements have a moderate influence on credit accessibility in SACCO’s. Pearson correlations also indicated that collateral requirements have a major positive significance contribution on credit accessibility. It was recommended that SACCO’s should therefore possess a wide range of collaterals and also develop a policy which allows use other forms of collateral other than guarantors and shares only. This will certainly increase access to credit in SACCO’s. However it is not clear from the findings of this study whether collateral requirements prompts members to shop for alternative sources of credit and ultimately influence their loyalty to their SACCO.

Khalayi, Alala and Musiega, (2014) conducted a study in Kakamega, Kenya on the effects of Interest Rates on Deposits Mobilization among SACCO Members using a comparative approach. The objectives of the study, among others were to analyze how interest rate for members’ deposits in SACCOs is established and to evaluate the relationship between interest rates and deposits mobilized by SACCOs. The study found out that interest rates affect the growth of SACCOs deposit positively but insignificantly. This result suggests that trying to influence the SACCOs deposits by manipulating interest rates is not likely to be a practical policy option in the study area. However, the SACCOs should attempt to maintain competitive positive real interest rates relative to that of other financial institutions in order to increase the savings. However, this study does not capture other aspects of SACCO relating to credit advanced to members. There is need, therefore, to conduct further research focusing on both facets of deposit mobilization as well as credit advancements. This can be achieved by concentrating on overall member loyalty.

Despite, the fact that SACCOs significantly contribute to the economic growth of Kenya, the performance of SACCOs, has greatly shrunk over the years. Kiraku and Okibo (2014) posit that the poor performance of SACCOs is attributable to withdrawal of members. This was evidenced by 44% of the respondents surveyed who consented that member withdrawal was hampering the SACCO performance. There has been increased competition in the SACCO sector, among the SACCOs themselves and from other financial institutions offering similar services. The strength of a SACCO depends, among other things, the membership base. Therefore, retention and loyalty of members is an important element of SACCO performance. Studies revolving around performance of SACCOs have attracted the attention of many scholars (Zerfeshewa 2010; Kiragu and Okibo, 2014, Mulwa, 2014 among others).

The general objective of this study was to establish the financial factors affecting member loyalty to SACCO’s products. This research sought to achieve the following specific objectives: To establish the influence of interest rates on loyalty to SACCO products by SACCO members in Ndege Chai and Imarisha SACCO; To determine the influence of the mode of disbursement of funds on loyalty SACCO products by SACCO members in Ndege Chai and Imarisha SACCO; To establish the influence of variety of financial products offered on the loyalty to SACCO products by SACCO members in Ndege Chai and Imarisha SACCO and To determine the influence of collateral required by SACCOs to SACCO products by SACCO members in Ndege Chai and Imarisha SACCO.

II. RESEARCH METHODOLOGY

Research design is the blueprint of the research. It shows how the various components of the research will be integrated so as to achieve the objectives of the research. Accordingly, this study employed a causal comparative research design. A causal-comparative design is a research design that seeks to find relationships between independent and dependent variables after an action or event has already occurred. It is appropriate where the goal of the researcher is to determine whether the independent variable affected the outcome, or dependent variable, by comparing two or more groups of individuals. This design was deemed appropriate for the study because the goal of the researcher was to determine whether the independent variable affected the outcome, or dependent variable, by comparing two or more groups of individuals in an organization.

A target population is the total population in the study in which the researcher wishes to investigate phenomena (Mugenda, 1999). The population of the study constituted of all the active members of Ndege Chai and Imarisha SACCO who were not employees of the respective affiliated companies. This comprised of a population of 441 from which a sample of 209 members was selected using Yamane, (1967) formula.

Data was collected by use of self-administered questionnaire and supplemented by an interview schedule.

The data were tested for reliability to establish issues such as data sources, methods of data collection, time of collection, presence of any biasness and the level of accuracy. The test for reliability established the extent to which results were consistent over time. The assessment of content validity of measures is carried by professional experts. The questionnaire was subjected to a panel of experts in the SACCO and financial industry to check the content relevance. The questionnaire was piloted before the actual survey using 30 respondents from Ndege Chai and Imarisha SACCO. The respondents who participate in the pretesting were eliminated from the actual survey. Reliability test was carried out to test the consistency of the research tools with a view to correcting them. The reliability was measured using Cronbach’s Alpha reliability coefficient for Likert-type scale Cronbach, (1951)

Collected data were checked for errors of omission and commission. The data collected were analyzed, with respect to the study objectives, using both descriptive and inferential statistics. Correlation analysis tested the relationship between the independent variables and the dependent variable while regression analysis was used to determine the contribution of each independent variable to the dependent variable. The following regression models was used to analyze the data

**Model 1**

\[ Y = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + \mu \]

**Model 2**

\[ Y = \text{Loyalty to their SACCO} \]

**Model 3**

\[ X_1 = \text{interest rates} \]

\[ X_2 = \text{mode of disbursement of funds} \]

\[ X_3 = \text{variety of financial products offered} \]

\[ X_4 = \text{collateral required} \]

\[ \alpha_0 = \text{Constant} \]

\[ \alpha_1, \alpha_2, \alpha_3, \alpha_4 = \text{Coefficients for } X_1, X_2, X_3, X_4 \text{ respectively} \]

\[ \mu = \text{Error term} \]

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III. RESULTS AND DISCUSSIONS

Data was analysed by use of correlation and regression analysis. The regression model was first tested for normality. The study tested existence of multicollinearity and obtained the results in Table 1

Table 1: Collinearity statistics

<table>
<thead>
<tr>
<th>Variables</th>
<th>Tolerance</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interest rates</td>
<td>.548</td>
<td>1.826</td>
</tr>
<tr>
<td>Mode of disbursement of funds</td>
<td>.508</td>
<td>1.970</td>
</tr>
<tr>
<td>Variety of financial products offered</td>
<td>.436</td>
<td>2.294</td>
</tr>
<tr>
<td>Collateral required</td>
<td>.427</td>
<td>2.339</td>
</tr>
</tbody>
</table>

Source: Survey data, 2016

The findings were also analyzed by correlation and regression analysis. The findings are presented in Table 2.

Table 2 Correlation matrix

<table>
<thead>
<tr>
<th></th>
<th>Y</th>
<th>X1</th>
<th>X2</th>
<th>X3</th>
<th>X4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X1</td>
<td>.848**</td>
<td>1.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>X2</td>
<td>.765**</td>
<td>.607**</td>
<td>1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X3</td>
<td>.310*</td>
<td>-.045</td>
<td>-.158</td>
<td>1.</td>
<td></td>
</tr>
<tr>
<td>X4</td>
<td>-.010</td>
<td>-.119*</td>
<td>.074</td>
<td>.689*</td>
<td>1.</td>
</tr>
</tbody>
</table>

Source: Survey data, 2016

Findings revealed a significant negative relationship between interest rates and loyalty to SACCO by its members (r= -.849; p<0.01). This means that the attractiveness of interest rates (X1) of SACCOs compared to other financial institutions is a crucial factor influencing the loyalties of SACCO members. Mode of disbursement of funds (X2) was also shown to have a significant positive influence of the loyalty of members at r=.765; p<0.01. The other two variable, variety of financial products offered (X3) and collateral requirement (X4) were found to have no statistically significant relationship with member loyalty. These results pointed to the conclusion that SACCO products were not highly differentiated and therefore variety of products was not an important factor and that collateral requirements were almost similar in all SACCOs.

The results of the regression analysis are shown in Table 2 and Table 3. Specifically, Table 2 shows the coefficients of each variable while Table 3 shows the summary of the regression model.

The study regressed growth of SACCOs against components of the financial factors affecting SACCO member loyalty to estimate a model for explaining the loyalty of SACCO members in terms of Financial factors.

The loyalty of Members was the dependent variable and the financial factors components were independent variables. To achieve this, a multiple linear regression was done on the financial. The assumption is that, mean of wealth index changes at a constant rate as the values of independent variables decreased or increased. The model is given as:

Y = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + \mu

Y = Number of years in the SACCO
Y = Frequency of use SACCO products compared to other financial institutions
X_1 = interest rates
X_2 = mode of disbursement of funds
X_3 = variety of financial products offered
X_4 = collateral required
\alpha_0 = Constant
\alpha_1 - \alpha_4 = Coefficients for X_1 - X_4 respectively
\mu = Error term

Table 3 Regression coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
</tr>
<tr>
<td>(Constant)</td>
<td>6.042</td>
<td>.248</td>
</tr>
<tr>
<td>X1</td>
<td>-.472</td>
<td>.032</td>
</tr>
<tr>
<td>X2</td>
<td>.334</td>
<td>.036</td>
</tr>
<tr>
<td>X3</td>
<td>.047</td>
<td>.048</td>
</tr>
<tr>
<td>X4</td>
<td>.044</td>
<td>.095</td>
</tr>
</tbody>
</table>

Source: Survey data, 2016

The estimated Equation is as follows:

Y_1=6.042-.472X_1+.334X_2+.047X_3+.044X_4

The results in Table 2 show that X2, X3 have positive coefficients. This means that every unit change in these variables results to proportionate change in the dependent variable. Proportionate increase in interest rates caused proportionate decrease in member loyalty. Whereas, proportionate increase in efficiency in mode of disbursement of funds and variety of products, resulted to proportionate increase in loyalty of members.

The regression model summary is shown in Table 4. The findings indicated that the R is .907(p<.001), R-Square is .818 (p<.001). These findings indicated that this model accounts for 81.1% of the variations in the customer loyalty among SACCO Members.

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Collectively, variations in interest rates, X1, mode of disbursement of funds, X2, variety of financial products offered, X3, and Collateral requirements, X4 significantly determine the variations in loyalty of SACCO members (R-square 0.818;p<0.001). The difference between the R Square and the R Adjusted R square is only 0.04 meaning that the model fit is very good. The Durbin Watson Statistic (DW=1.889) is also within the recommended range of 1-3.

The study therefore concluded that interest rates, mode of disbursement of funds, and Collateral requirements, significantly accounts for 82.2% of the variations of membership loyalty in SACCOs and that 17.8% of loyalty of members are attributable by other factors not accounted for by this model.

IV. CONCLUSIONS AND RECOMMENDATIONS

The overall objective of the study was to establish the factors that determine customer loyalty to the products of financial institutions in SACCOs. Specifically, the study sought to establish the effect of interest rates on loyalty to SACCO products by SACCO members in Ndege Chai and Imarisha SACCO, to determine the influence of the mode of disbursement of funds on loyalty SACCO products by SACCO members in Ndege Chai and Imarisha SACCO, to establish the relationship between variety of financial products offered and the loyalty to SACCO products by SACCO members in Ndege Chai and Imarisha SACCO and to determine the influence of collateral required by SACCOs to SACCO products by SACCO members in Ndege Chai and Imarisha SACCO. The findings in respect to each of the objective are summarized as follows.

First, regarding the effect of interest rates on loyalty to SACCO products, the study found that interest rates are an important consideration on the loyalty of SACCO members. This was shown by a significant negative relationship between interest rates and loyalty of SACCO members. Likewise on the effect of mode of disbursement, the study established a positive relationship between the mode of disbursement and the loyalty of SACCO members to their SACCO.

The study established that most members of the SACCO considered the collateral requirements of their SACCO as being comparable to other SACCOs. The risk of default among SACCO members is reduced by the fact that the loans are guaranteed by fellow members’ savings. Therefore this finding supports the fact that SACCO security requirements are better than those of other financial institutions.

The study established that variety of products offered by the SACCO had positive relationship with the loyalty of SACCO members. Proportionate increase in variety of products offered by SACCOs results to proportionate increase in loyalty of members.

Spanning from the findings of the study that interest rates, mode of disbursement and variety of financial products have significant influence on the loyalty of SACCO members, the study concluded that these were the most important financial factors significantly that affect the loyalty of SACCO members and that these were crucial variables that could be manipulated to improve loyalty.

The study established that interest rates have significant negative relationship with members loyalty. The study concludes that increase in interest rates reduces the loyalty of SACCO members. The study findings showed that SACCOs have comparative advantage when compared to other financial institutions regarding it comes interest rates. Many respondents suggested that the interest rates offered by their SACCOs were actually competitive. From the finding that variety of products offered by SACCOs had significant positive relationship with loyalty of members; the study concludes that variety of financial products offered is an important marketing tool, which significantly changed the loyalty of members.

Finally, from the finding that collateral requirement has no significant correlation with loyalty of members, the study concludes that many SACCOs and financial institutions had almost identical collateral requirements and therefore, it may not be considered as an important factor which may shift the loyalty of a SACCO member.

Recommendations:

From the conclusions of the study, several recommendations were made, to the management of SACCOs, policy makers and the academia. First, it was recommended that SACCOs, seeking to enhance retention of their Members should focus on providing competitive interest rates. It has been shown that the cost of capital in Kenya over the recent past has really gone up, leading to a popular law enactment of curbing interest rates. Therefore, stakeholders in financial institutions should focus much on this variable.

Secondly, the mode of disbursement of funds had been shown to had a significant influence on loyalty of SACCO members. This findings lead to the recommendation that, SACCOs should find modalities of improving their efficiency in disbursement of funds. Of essence here was the period taken for approval and subsequent disbursement of funds.

It was also recommended that SACCO’s should therefore develop a wide range of collaterals and also develop a policy which allows the use other forms of collateral other than guarantors and shares only. This might increase access to credit in SACCO’s, maintain their members and even attract more members to the SACCO.

For academia, this study has made significant contribution. Hitherto, many studies had focused on non-financial factors. This study provided a framework in which related studies could be replicated in other financial institutions.

Recommendations for further studies:

The scope of this study was SACCOs operating in Kericho County. It is recommended that a similar study could be conducted among SACCOs in other areas of jurisdiction. Further
insights regarding the phenomenon could be adduced from a similar study conducted using a longitudinal research design where data is collected on similar respondents over a longer period of time in order to show the loyalty preferences over time and the possible explanations.

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AUTHORS

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Sustainability of Community Based Projects in Archdiocese of Nairobi - Kenya

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Abstract- The general objective of the study is to assess factors affecting sustainability of Catholic Church community based projects with reference to Catholic Archdiocese of Nairobi in Kenya. This study was based on Stakeholder and Human Capital theories which have also been discussed. The research study adopted a qualitative research methodology and the survey design. The target population comprised of all the 156 community based projects undertaken in Catholic Archdiocese of Nairobi within the timeframe 2011-2015. Cluster sampling was done based on the thirteen deaneries in namely Nairobi central; Nairobi Western; Nairobi Eastern; Ruaraka; Makadara; Outering; Thika; Mangu; Gatundu; Githunguri; Kikuyu; Kiambu and Limuru. A sample of 69 was selected; 29 project managers and 37 users and 3 key informants were selected. Three questionnaires, which comprised of both structured and unstructured items, were used to collect data. Therefore the type of data collected was both numerical and descriptive. Data analysis was done using SPSS (Version 21) and presented through percentages, means, standard deviations and frequencies. The information was displayed by use of tables, bar charts and histograms. Qualitative data was analyzed thematically through content analysis. It was found that though the top management is an important aspect, its support for sustainability of various resources allocation is weak and almost nonexistent in many projects. It is recommended that the project managers should create an environment where all users feel part of the team that run projects. It is also recommended that sources of finances be made known to create accountability and transparency. This would enable stakeholders to feel that there is top management support to financial allocation and sustainability as opposed to the current feeling. To establish how well the resources have been utilized in the projects which could have improved sustainability. More studies may also be done to establish whether communities have been contributing towards the sustainability of their projects through voluntary work, fundraising and through awareness for success and sustainability of these projects. More studies should be done to establish whether there are known economic and political factors that affect success of these projects.

Index Terms- management support, management competency, stakeholders’ involvement, church structure, community based projects’ sustainability

I. INTRODUCTION

The Catholic Church has been involved in community based projects even before Kenyan political independence. This has been in terms of education, schools, both primary and secondary, colleges and trade institutions and in health sector. In addition the church has been having various other types of projects such as income generating projects, service rendering projects and skills imparting projects (Catholic Church Diocesan Development Office, 2012).

Globally, billions of shillings have been spent in communities to enhance the living situation of the people. However, one of the most critical obstacles is the extent to which the projects are able to persist despite the exit of donors, while the beneficiaries reap dividends; appreciate their participation and ownership role in the project. Apparently, it is sustainability that makes the difference between success and failure of community-based projects. Various factors such as technical, financial, institutional, economic, and social factors contribute to the failure to sustain the projects if not considered well in the project management cycle (Oino et al., 2015; Ochunga, 2016).

In an effort to analyze the global sustainability of community based projects in six countries (Benin, Bolivia, Honduras, Indonesia, Pakistan and Uganda). Katz and Sara (1997) found that the community-based approach significantly increased sustainability. The analysis found that there exist a strong linkage between participation of the community members and success of the projects. Success was achieved owing to the fact that community members were able to access information, capacity build at all levels, trained in operations and maintenance, control over funds, and good quality construction.

According to UNHCR (2008), a community-based approach is a way of working in partnership with persons of concern during all stages of project cycle. Community-based approaches recognize the resilience (UNHCR, 2001), capacities, skills and resources of people concerned, and build on these to deliver protection and solutions that support the community’s own goals (UNHCR, 2008).

In the growing or developing economies of the world, especially in Africa and Latin America, the role of the Catholic Church in regional development is indisputable and inalienable, notably in the wake of political colonization, decolonization, secularization, secularism and politico socioeconomic decentralization (Daily Graphic Editorial, January 20, 2009). This role must also be unambiguous as it exceeds the acquisition of managerial competence and social service skills towards social infrastructure and service provision. It tickles the church in

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development and makes church development distinct from that of other development actors. It is contingent on moral stature and spiritual discernment.

The Catholic Church is perhaps one of the oldest institutions with sustainable structures in the whole world. The sustainability is founded on long tradition, inspiring scripture, clear leadership and reliable network. The Church has showed her serious commitment to end poverty, diseases and ignorance in its mission to the world through community based projects. Recently, the church has demonstrated a more specific commitment to addressing the current issues related to the climate change when Pope Francis released the encyclical on the climate change. The encyclical addresses the issues related to the Sustainable Developmental Goals proposed by UN.

In Kenya, there are at least 26 dioceses covering every part of the country from grassroots to the national level with over 12 million Catholics, over 2000 educational institutions, several pastoral centers, shrines, retreat centers, hospitals, children’s homes etc. These are among the many opportunities that the church can use in terms of awareness creation and project implementation for continuity and sustainability.

The Catholic Church Diocesan Development Office (DDO) of Nairobi was established in 1974 and is the development wing of the Diocese. It coordinates all socio-economic development interventions in the Diocese and has spear-headed development in the Region as the pacesetter and pathfinder (The Church Organization Research Advisory Trust (CORAT), 1983). Evaluation of the Diocese states, inter alia: “There is an appreciable infrastructural development, which has provided the populace with schools, vocational training institutes, hospitals and health clinics, boreholes and feeder roads among others. Further the diocese has integral socio-economic development in areas of women and development, agriculture, etc. all geared towards uplifting of the standards of life of the people.” The Olennu Report (1992) details the mission, vision, goal, objectives and functions, among many aspects of the DDO.

However, the project activities collapse following the phase-out of funders support. A World Vision (2009) evaluation report analysis show that, most community development projects have failed to sustain themselves, become self-reliant and the communities have failed to continue running them after funding organizations withdraw their support. Some factors which should have been worked out, in order to stop this trend of projects collapsing are not done despite support being meant for a specified period with the objective of making the projects self-reliant.

Billions of shillings have been spent in communities to enhance the living situation of the people. Aid effectiveness is a growing concern for the donor community. In the recent past, development practitioners have been focusing on efficient aid delivery to education. The shift from project mode to Sector Wide Approaches, Structural Adjustment measures to Poverty Reduction Strategy Papers, Programme-based Approaches, Direct Budget Support, Medium-Term Expenditure Frameworks reflect this concern for reducing the fragmentation of development systems and change the way aid is delivered by shifting the balance of power (Adhiambo, 2012).

In developing countries, Cleaver (1999) found that the community based projects need to have long-term effectiveness of participation. Limitations of communities in mobilizing the necessary resources, either through collecting funds from community members or lobbying government officials, greatly affected project success. Narayan (1995) analyzed lessons from 121 community projects funded by different agencies in 49 developing countries and found that the participation of local communities was an important factor for project effectiveness and sustainability.

It is estimated that 35% of community projects in Africa are non-operational (Ababa, 2013). Chambers (1983) points out that involvement allows people to have access to productive resources which enable them to increase their earning and obtain goods and services that they need and to participate in the decisions that affect them. Involvement methods can be used to guarantee the inclusion of all the stakeholders, the establishment of agreements between them and the provision of appropriate information at each level and for different purposes.

In Kenya, an estimated two million people are being positively impacted by community based projects efforts. There has been forecast sustainability and the probability that a project shall continue long after the outside support is withdrawn. Consequently, while thinking of project sustainability, three things must be born in mind; the community, project results and external assistance. A project is sustainable if the community/beneficiaries are capable on their own without the assistance of outside development partners, to continue producing results for their benefit for as long as their problem still exists.

According to KWAHO, the success of community based projects in Kenya, has been due to the strategies integrated before the projects are completed, which include sensitivity to socio-cultural factors in the communities where the project are being implemented. Community-based project success is about creating a more just and equitable community through encouraging social and cultural diversity (Roseland et al. 2005). Any community-based project therefore, must give much consideration to socio-cultural aspects in any given project during pre and post-implementation (Matthews & Herbert, 2004).

The Archdiocese of Nairobi covers two counties - the City of Nairobi (Nairobi County) and Kiambu County. It covers an area of 3,721sq. Km and is divided into thirteen deaneries. This population is highly cosmopolitan due to the fact that Nairobi city is the capital of Kenya with people from all communities in Kenya and the world at large. Currently, the ordinary of the Archdiocese of Nairobi is His Eminence, John Cardinal Njue assisted by Rt. Rev. David Kamau Ng’ang’a.

Many CBPs facilitators and donors have initiated several community based projects in the Catholic Archdiocese of Nairobi as an intervention measure. These CBPs includes: World Vision, Swedish group, Catholic dioceses of Nairobi, Red-cross, Compassion and Rincord International. Initiated projects include bore holes, health facilities, and irrigation projects. All of these were established under the assumption that after the agreed period by the Support office and the facilitating partner end, the project would become self-supporting and continue meaningful service to the community. In other words this study will present a critical view of how community development projects have been managed and sustained long after donor phasing out with a
particular focus to community based projects in Catholic Dioceses of Nairobi.

The challenges are to satisfy today’s needs without jeopardizing the possibility of future generations to satisfy their own needs (Carl, 2006). Sustainable development may indeed require a strong policy on the part of Government and other stakeholders of protecting the natural resource base if the same is not in place. The source base including all forms of capital should perhaps be maintained intact or even enhanced. A sound program design, adapted to local conditions and based on simple methods that facilitate beneficiary involvement i.e., Participatory Rural Appraisal (PRA) should always be chosen and beneficiaries should be involved in the selection. Participatory survey should define the social context of support, and communities should be well organized, trained, and sensitized before needs are identified.

A number of community-based projects including Church initiated projects, are successfully brought to completion and closure. Nevertheless, the completed projects had their fair share of challenges. Project sustainability is one of such challenges not only to projects in Kenya, but also in many other countries most of these projects are donor driven which results into dependence. Donors such as the World Bank, DFID, USAID, SALVATORIAN, MIVA and other bilateral aid agencies have been expressing concerns on project sustainability (Oino, Towett, Kirui & Luvenga, 2015).

There has been a concerted effort by different scholars to underscore factors influencing community based project sustainability. Nonetheless, empirical studies have not investigated in depth on how management support, project management competency, church structures and stakeholder involvement in project management influence sustainability of projects implemented by the Catholic Church. This study therefore sought to investigate some of the selected factors affecting sustainability of Catholic Church community based projects with reference to Catholic Archdiocese of Nairobi.

The general objective of the study was to assess factors affecting sustainability of Catholic Church community based projects with reference to Catholic Archdiocese of Nairobi. The specific objectives were: to examine the role of management support on sustainability of Catholic Church community based projects, to assess the contribution of project management competency on sustainability of Catholic Church community based projects, to assess the extent of stakeholders involvement on sustainability of Catholic Church community based projects and to examine the influence of church structure on sustainability of Catholic Church community based projects.

II. LITERATURE REVIEW

1.1 Theoretical Review

1.1.1 Stakeholders’ Theory

Stakeholders’ Theory was a brainchild of Edward Freeman (1983) outlining how management can satisfy the interests of stakeholders in a project or business. The theory argues that every legitimate person or group participating in the activities of a firm or organization, do so to obtain benefits and that the priority of the interest of all legitimate stakeholders is not self-evident (Donaldson & Preston, 1995). Stakeholder Theory pays equal credence to both internal and external stakeholders; employees, managers and owners as well as financiers, customers, suppliers, governments, community and special interest groups.

Stakeholders’ involvement enhances social cohesion as they recognize the value of working in partnership with each other and organizations. It also adds economic value both through the mobilization of voluntary contributions to deliver regeneration and through skills development, which enhances the opportunities for employment and an increase in community wealth, gives residents the opportunity to develop the skills and networks that are needed to address social exclusion.

This theory was relevant to this study in that Catholic Church community based projects must ensure the community members voluntarily and actively participate in the projects from the start. It also emphasizes that the community members also benefit from their involvement. Therefore our Community projects management need to ensure the community members also are involved in the decision making, their staffs are trained on handling the community members and also the community members’ interests are considered.

1.1.2 Human Capital Theory

Human Capital Theory was popularized by Gary Becker and Jacob Mincer (1993). It states that human capital is a stock of competencies, knowledge, social and personality attribute including creativity embodied in the ability to perform labor so as to produce economic value. According to the Organization for Economic Cooperation and Development (OECD, 2001), human capital is key for social and economic well-being. Knowledge of an individual gained from education adds economic value to a firm, (Becker, 1964). Skills and knowledge gained through education are importance to employees when they are performing their tasks as it improves their performance.

Community based project management teams require technical skills to run the projects successfully. These skills could be gained from technical institutions, formal education or on job training. This theory has been put in application in several occasions. The relevance of this theory is that the need for the community based project management team to have skills and experience in project management cycle. They need to use these tools and techniques when running the projects.

1.2 Empirical Review

Community based project sustainability ensures creation of a more just and equitable community through social and cultural diversity (Roseland et al., 2005). Therefore any community based project must consider socio-cultural aspects within a given project during before and during implementation. Sustainable project designs utilize the important cultural aspects, can to synthesize the past with the present for future (Matthews & Herbert, 2004).

Sustained projects will always become points of reference for other communities that need to undertake similar projects and thus become examples for learning. Project sustainability is important since it helps in expected and acceptable use of the massive resources in the project. Thus continuation of the project long after external support has ceased, leads to economical use of resources and avoids misuse of the same. Projects which are initiated and funded are mainly funded projects for children
younger than 15 years of age. These are most commonly schools, orphanages, rehabilitation centres, health and nutrition programs, and care for pregnant mothers. Other Funds go to projects that assist the whole parish community in their pastoral work. These projects mostly include the construction of parishes, halls, presbyteries and or living remunerations of priests. A large portion is for the training of local catechists in mission stations, far from parish centres, who are the mainstay in the faith formation of the community. Also funding goes to projects for the training of priests and religious brothers and sisters in their initial years of training, or novitiate (Catholic Mission, 2013). Jennings (1999) reviews a number of variants on these individual versus society conceptions, giving emphasis to racial and political dynamics. Rank (2004) is very clear that the focus on individual attributes as the cause of poverty calling for community based projects is misplaced and misdirected. Structural failings of the economic, political and social system are causes instead. He further focuses on various divergent theories where each result in a different type of community development intervention strategy. In any meaningful development activity popular community participation is inevitable. This finally prepares an avenue for community participation; a concept which connotes the direct involvement of local people in home-grown affairs such as building of roads, schools or election of local and civic leaders (Middler et al., 2006). This study thus dwells on such theoretical underpinnings of stakeholder involvement.

2.2.1 Management Support and Project Sustainability

Globally there has been the need to understand the factors influencing project sustainability; there is a need to monitor the aspects of project financial sustainability. Financial sustainability also sustains the managerial as well as the technical sustainability of a given project. Financial sustainability can be achieved through monitoring of net income, profits and liquidity-which is the ability to meet the cash obligations such as paying of bills and relationship between assets and debts. Secondly, stakeholders must recognize and share the benefits. Stakeholders play critical roles which promote projects sustainability (Kuria & Wanyoike, 2016).

Internationally, we have many Catholic Church projects which are funded through the Catholic Mission that operates through the international structure of the Catholic Church. It is also a member of the international Catholic network, the Pontifical Mission Societies. This mission has great respect for local people’s determination of their needs. This necessitates that all request for funds should come from the community or from the parish religious congregation and should pass through the local Bishop of each diocese (Catholic Mission, 2013). Also Catholic Foundation Grants program also funds very many current needs in the communities. Under the terms of its charter, the Catholic Foundation can distribute grants only to qualified Catholic ministries, parishes and schools with principal offices in the Archdiocese of Brisbane and others whose values align with the teachings of the Church and follow best practices for non-profit organizations (The Catholic Foundation, 2014). Another example of Caritas Australia shows that vast majority of the funding comes from individuals without any direct funding from the Catholic Church. However, not all church goers, who recognize the activities being done, would contribute to reenergize such courses of action, by contributing to Caritas Australia.

Catholic Mission funds application process for funds passes through the local bishop of each diocese. Even if these requests come from parishes or groups within the diocese, they must communicate with the local bishop and inform him of their request and must be made on Pontifical Mission Societies’ application forms, be approved and signed by the diocesan bishop. Bishops then send these applications to the headquarters in Rome, before 15 December. In May of the following year, all the National Directors of the 160 countries where Catholic Mission exists meet for a week to approve projects and assign funding portions per project. Due to more demands than the available funds, projects usually receive about half of their initial request (Catholic Mission, 2013). Following this approval, for example, Catholic Mission in Australia is advised about the particular projects to send the money directly to. In August more funds is directly transferred to each individual country and bishops in those countries pass the money to each individual project (Catholic Mission, 2013).

Tooley (2015) notes that according to Cardinal Theodore McCarrick the Archbishop Emeritus of Washington and the Chairman of Sub-Committee of the Church in Africa, people of Africa greatly benefit from proper training in pastoral care, training and management. Therefore the support from the church in America to Africa is integral towards enhancing self-sustainability of church in Africa and also to meet the spiritual needs of its people. This therefore led to the approval of 47 grants for a total of $1,205,236 to support church of Africa by the same committee in 2015. Among the beneficiaries was the Catholic Church in Ethiopia, in Luanda, Angola and in Liberia (Zenit, 2016).

To fund community projects Catholic Church dioceses and even the affiliated Faith-based organizations make partnerships with different donor agencies. For example in South Africa, various dioceses, religious congregations and departments have established their own workable links with bodies such as Broederlijk Delen, Trocaire, Missio, Kirch-in-not, Misereer, Caritas, CAFOD, Catholic Charities USA and among others. Many foreign missionaries get funds from their home dioceses and from other supporters. More funding has been realized directly from governments and international trade blocks like the European Union especially to help in socio-political changes (Bate, 2001).

In Rwanda, every institution has room to grow and the Catholic Church continues on its path to sustainability and self-sufficiency. CRS Rwanda remains a committed Church partner. In the coming years, the Church and CRS hope to expand the capacity strengthening throughout each of Rwanda’s nine dioceses and 168 parishes to facilitate ownership and sustainability of the efforts and in line with CRS commitment. This expansion will highly rely on a peer-to-peer training and accompaniment model that will utilize technical experts within the Church (CRS, 2013). CRS regards capacity strengthening as essential to any organization’s growth which should include capacity building with focus on individuals or teams to enhance and develop new knowledge, skills and attitudes for people to function better; institutional strengthening, focusing on the organization, developing its systems and structures for more
effective functioning, work towards sustainability and achieve goals; and accompaniment, dependable instruction and mentoring that allows mastery of new skills or new organizational systems to become standard operating procedures (CRS, 2013).

There are 26 dioceses in Kenya covering every part of the country which have over 12 million Catholics, more than 2000 educational institutions, several pastoral centres, shrines, retreat centres, hospitals, children’s homes and homes for the aged. This is mainly, how the church creates awareness, implements projects and ensures sustainability (Kwanya, 2015). Insufficient financing is a major factor in poor maintenance which, in turn, is often cited as a reason for project failure. Communities also raise funds. Therefore commitment of resources, particularly finances, by beneficiary communities is viewed as an important indicator of the expected value of the project to these communities. When communities recover costs or stabilize in raising funds for maintenance, it contributes to sustainability by increasing resources and expanding benefits. Beneficiary contribution to capital costs, either labour or money, may be a significant indicator of system sustainability. However, this contribution to capital expenditures, in cash or in-kind, is not in itself an assurance of sustainability (Kuria & Wanyoike. 2016).

People have the knowledge and capacity to exploit the natural wealth around them yet cannot access them. Therefore the Church through its systems, structures, institutions and influence can advocate and conduct awareness programs in every community. Besides the Church can initiate microfinance projects to empower various communities in the country especially women and youth (Kwanya, 2015). There is extensive discussion about international project funding and the discrete sources of funds are known. However, there is little literature on how the funds are distributed to projects based on the intensity of needs as well as the procedures used to make such payment. Therefore there is need to understand such processes and also know how they influence project sustainability in Nairobi Archdiocese. We do not know how human resource is assigned to these projects. We also do not know how capacity building is done and also how the physical resources are assigned for project continuity.

2.2.2 Project Management Competency and Project Sustainability

Projects would become self sustaining due to a number of factors one of them being the managements’ application of hard and soft skills. In 2013, a closer look at National Development Agency funded farming project in Johannesburg, South Africa, revealed the Project impact on the participants and community households benefit in that from the project as they produce products for self consumption and some community members buy food from the gardens as well. It was also revealed that the project could be more sustainable if member receive thorough training on marketing and all other problems. Above all, the literacy level of members who managed their own projects was very low (NDA, 2013).

In Kenya as in the entire African continent, CAFOD has done numberless projects. A project dubbed ABG-Realizing the Faith Potential will be carried out in four Arch Dioceses in Kenya, covering a total of 25 Catholic dioceses at different levels which are, Eldoret, Embu, Garissa, Homa Bay, Isiolo, Kakamega, Kericho, Kisii, Kisumu, Kitui, Lodwar, Machakos, Malindi, Maralal, Marsabit, Meru, Mombasa, Muranga, Nairobi, Nakuru, Ngong, Nyeri and Nyahururu. The legal holder will be Kenya Conference Catholic bishops secretariat under the Governance and Democracy Programme within Catholic Justice and Peace Commission and has main aim of improving governance in Kenya in dioceses by carrying out intensive civil campaigns, development of a simplified version for Constitutional Education during diocesan Workshops and throughout all established church structures. To attain high quality work the project shall train its National office holders in Project Proposal writing, Monitoring and Evaluation, Statistical Package for Social Sciences and training in conformity to International Reporting Standards for £184,274 (CAFOD, 2016). Diocese of Ngong in Kenya has a strategic plan for 2016-2020 particularly for Kajiado and Narok counties which have always experienced prolonged droughts that have adversely affected people’s livelihoods resulting to households’ loss of up to 90% of their livestock. Main aim is to have increased sustainability of WASH facilities, increased and consistent access to portable water by people and livestock among others. Some of the strategies are; facilitate development of water harvesting and adequate water storage facilities for institutions and households, capacity development of water community committees for improved sustainability of facilities, undertake environmental sensitization, conservation and protection initiatives and support community capacity development on improved sanitation and hygiene practices through experienced professionals (Catholic Ngong Diocese, 2016). This calls for both participation and partnership with all stakeholders and ensure capacity building for all. Stein (1998) in Adhiambro (2012) posits that people’s participation provides an opportunity to establish new skills and habits of control, reporting and joint responsibility in development interventions. People’s participation also helps for an improved understanding of the role of the involved stakeholders and the limitations of technical and financial resources that exists to address existing problems. However, such issues like low accountability on donor funded projects in Kenya have also not received the necessary attention they deserve.

Success from a project is attainable through the effort of all the participating team members where the project manager leads, organizes, delegates and controls the processes and activities in a running project. He/she should hold right skills and experience to guide the rest of the implementing team with certainty and competence. He/she should be able to share the vision. He/she should be someone who lifts us up, gives us a reason for being and gives the vision and spirit to change. A leader should offer people opportunities to create their own vision, to explore what the vision will mean to their jobs and lives and to imagine their future as part of the organization’s vision (Bennis, 1997).

Project managers should be willing and able to delegate duties since successful delegation is crucial to successful project management. However, many people are afraid of delegation. They fear that if they delegate, the work won't be done properly and deadlines will not be met. They do most of the things themselves and directly oversee the rest of the team. Trust is an essential element in the relationship of a project leader and his/her team. You demonstrate your trust in others through your actions. That is how much you check and control their work, how
much you delegate and how much you allow people to participate. Barry notes that individuals who are unable to trust other people often fail as leaders and forever remain little more that micro-managers or do all the work themselves (Barry, 2000). Project leadership calls for clear communication about goals, responsibility, performance, expectations and feedback. The project leader is the team’s link to the larger organization. The leader must have the ability to negotiate and use persuasion to ensure the success of the team. He/she should be clear, concise language with the intention informing, warning, encouraging or eliciting an action by the team members. Above all, he should be a good negotiator and Solution maker. We expect our project leaders to have excellent problem-solving skills themselves. He/she should be a solution maker in times of crisis by having a fresh, creative response to here-and-now prospects and not much concern with how others have performed those (Kouzes, 1987).

A leader with a hardy attitude will take problems in stride (Barry, 2000). When leaders encounter a stressful event, they consider it interesting, they feel they can influence the outcome and they see it as an opportunity. Out of the uncertainty and turmoil of change, leaders rise up and articulate a new image of the future that pulls the project together (Bennis, 1997).

Project leaders should appreciate that team members have diverse economic, socio-cultural needs and responsibilities (Kwanya, 2015). Empathy, presupposes the existence of the object as a separate individual, entitled to his or her own feelings, ideas and emotional history. It is nice when a project leader acknowledges that we all have a life outside of work. Expertise in leadership skills are truly enviable competence. Therefore the ability to challenge, define, design, inspire, enable and encourage must be demonstrated if leaders are to be seen as capable and competent (Paul, 1970).

Having the right person in charge ensures better project outcomes in terms of higher quality, lower risk of project failure and more peace of mind. Better project management reduces the risk of project failure and translates to favourable project outcomes like lower costs and higher client satisfaction (Langer et al., 2007). His/her interpersonal skills is yet another indispensable attribute since poor project management can not only impact a firm tactically, economically or culturally, but may also endanger client relationships, result in project cost overruns and tarnish the project team’s spirit. In the long run, the goal for an organization is to build capabilities that lead to an improved cost structure, and thus the resource allocation can be viewed as a strategic tool (Venkatraman and Prescott, 1990).

The more technical skills the manager brings to the project, the greater would be the probability of project success. While the direct impact of these skills is anticipated, we need to explore how the harmony between his/her skills impacts project success. The impact of fit between skills and environment on performance is more significant compared to the direct impact of skills on performance (Pagell et al., 2000). While hard skills are essential in PMs, soft skills are especially important for PMs because of the nature of their role not only within the project but also in the organizational and client relationship structure. Lee et al. (1995) argue that interpersonal and management skills are critical for the project professionals. PMs have to interact with many stakeholders. They have to not only manage internal project teams, their peers and superiors, but also interact with clients, using skills that are essentially non-technical in nature. These skills include but not limited to organizational knowledge, tacit knowledge in handling people within the organizational structure, leadership and management skills, and customer handling skills (Becker, 1975; Lee et al., 1995). Within project teams, as individual’s progress from technical roles to more managerial roles, these skills come into play and help in effective project management. Wagner and Sternberg (1985) focus on skills that are tacit and gained through experience rather than being taught in a classroom. They classify these skills as related to managing self, others and the career. Project’s success highly relies on these skills on the part of the management.

In the developing world there has been constant demand by donors for managers to apply tested project management skills. Therefore Loo (2002) identified the following areas for improvement in project management practices for project managers which are: technical areas, improved scope management, improved budget management, integrate project control measure, implement standard project management practices, organizational learning, project reviews, effective resource planning, training for staff at all levels, empower teams and effective communication.

On the other hand, Pinto and Slevin (1988) listed the following as indispensable items project success namely: Project mission, top management support, project schedule, client consultation, effective personnel recruitment, technical tasks, client acceptance, monitoring and evaluation, communication and troubleshooting. In some countries like Kenya and Ethiopia, tapping local talent has become relatively simple because the donor community has been working on the ground for a long time now and there is a relatively adequate pool of talent to recruit from. However, other countries, especially those with higher rates of illiteracy and perennial political unrest such as Afghanistan and Pakistan, though have lately seen an upsurge of aid activity, are harder to recruit for (Kennedy, 2012).

It is noteworthy that, Churches play a central role in development. They motivate voluntary action and advocacy. They provide vital services to the most marginalised and needy. As societies and individuals are, churches are also in constant and necessary process of change. But we can also learn from one Ethiopian Synod, which was divided and became bankrupt in 2002. People’s trust was lost. Leaders were corrupt. But the Synod gradually transformed. Trust returned, relationships were restored and the books began to balance. Churches are immensely challenging organizations to lead, to be a part of and to support development. In social development, churches have frequently failed to live up to expectations. Some appear uninterested in the poor; others take a ‘handout’ and disempowering approach. Conflict is also too apparent in some churches. There is a worrying frustration, a sense of unfulfilled expectations and constant wish for the church to be different where it sets an example and brings light to the world, to transform lives (James, 2009).

A study by Murungi on donor funded education projects in Kajiado in 2015 indicated that, the study’s four independent variables explained only 84.5% of the project management practices on implementation of donor funded education projects as shown by the R square. Therefore other factors not studied in this research contribute 15.5% of the project management.
practices on implementation of donor funded education projects. Therefore, further research should be conducted to investigate the other factors (15.5%). Other variables considered important to study are; risk management, time management, human resource management, and accountability among others that affect implementation of donor funded education projects (Murungi, 2015).

Murungi’s study and many others did not study or recommend that PM skills be investigated for their influence in sustainability of the projects. This study should thus devote to establish if the PM in these catholic-based community projects are optimally skilled and whether their skills have influenced/affected continuity of their development projects. Further studies should be conducted by this investigation to establish whether project managers have adequate supervisory, coordination and ad communication skills in the Nairobi Catholic Church Archdiocese.

2.2.3 Stakeholders’ Involvement and Project Sustainability

The term “Community” has often been used to denote a neighbourhood, a group of local NGOs, the residents of a small town, a workers’ union, a group of women, among others. In this sense, the term does not refer what this group of people really have in common or their dissimilarities. The term “Participation” is also randomly used to denote civil debate and communication, delegation of activities, self-help construction, consultation, partnership, communal meetings, political decentralization. The lack of clarity in the use of these terms has led to varied interpretations on the role of community participation in programmes (Davidson et al., 2007; Diang’a, 2012).

For effective church projects, a cross-section of the community must participate in the development process and must do so indefinitely. The community must be in direct or indirect control of the operation and management of its own ventures. They should be allowed to make strategic decisions about the process, from the design phase onwards. This creates perception of ownership by the user community which is an important ingredient for the contribution to the recurrent costs of running and maintaining the system which need not always be financial in nature (Macharia et al., 2015). On partnership which is an important aspect of participation, CAFOD for example, has works in trust with hundreds of Church, secular and other faith organizations worldwide to achieve positive change at all levels of society and to maximize the benefits offered by the vast systems of the Church and other faith and civil society networks, at the points of extreme need. Working in partnership is a primary expression of solidarity and the healing power of relationships in transforming our world (CAFOD, 2016).

Matthews and Herbert, (2004) argue that, to enhance sustainability, the community members must be seen to be capable of steering their own destiny. In this sense, at all stages of project cycle, they should be followed systematically to contribute what they have or know, share and learn what they do not know to increase their capabilities. Therefore project sustainability empowers the community to continue producing the much needed results, to ensure their most felt need is met thus, solve their problem long after the external assistance has stopped.

All this is based on the principle of community based popular participation which deals with broad issues of social development and the creation of opportunities for the involvement of people in economic, political and social life of the nation (Obbo, 2003). Thus in this way it prepares a way for community participation, a concept which connotes the direct involvement of local people in local affairs such as building of roads, schools or election of local and civic leaders (Middler et al., 2006). Concepts concerning community participation offer one set of explanations as to why the practice of community engagement might be useful in addressing the physical, interpersonal, and cultural aspects of individuals” environments (Braithwaite et al., 1994). It is worth noting that change is more likely to be successful and enduring when the people it affects are involved in initiating and promoting it (Thompson et al., 1990). In this study, stakeholder participation at all levels is very critical to achieve project sustainability. This popular participation need has also brought about the growing trends of NGOs to work with government, donors and to provide joint activities like providing specific inputs and capacity building (Kuria & Wanyoike, 2016).

This is intended to result to: Technical sustainability which refers to the reliable and correct functioning of the technology for an acceptable quality of service and deliverables and the ability to meet the demands of all user assemblies. Requirements for technical sustainability include: a good design, which adheres to construction and operation and first-rate workmanship and materials; financial sustainability where systems can only function if financial inputs meet at least the costs of operation, maintenance and inevitable repairs. We should know who pays for all this and how fairly payments are shared between and within users groups; Institutional sustainability which is to keep systems operational, accessible and widely used for operation and capacities for management and accountability. In here, the voice of all the user groups, the poor and the women is ensured; Social sustainability where users will only sustain services that satisfy their expectations. That is the services which are easily accessible, in accordance with their socio-cultural values and practices and services considered to be worthy the incurred cost. Environmental sustainability incorporates fair share of responsibility among users for the protection of their environment and all natural resources like water among others (Macharia et al, 2015). However, Cooke and Kothari (2001) conclude that, most decisions for development projects in several third world countries are taken with minimal consultation of the local people such that even efforts to engage them in participatory planning do not reflect their choices. Many organizations just co-opt communities into projects for purposes of winning the donor confidence. It is sad to note that rarely do we take note of the various participation aspects such as passive, functional, consultative, manipulative, and interactive and self-mobilization (Morse & McNamara, 2016).

The aspect of community development as suggested by Paulo Freire in 1972, Pedagogy of the oppressed, has not found favour even in the Catholic Church pastoral work in South America. However, Catholic Church in the North is a community seeking lasting transformation with members open to learning from each other rather than just a temporary and transient partnership meant to deliver a single development project. As
such the Catholic Church chain is an example of a long-term partnership of members based on shared beliefs and morality which stress tolerance, respect for neighbours and a need to listen (Morse & McNamara, 2016). Another important contribution of participation in project effectiveness is that it certifies that the development activities are based upon local knowledge and are more relevant to local people (Karl, 2000). Local people understand their problems better and can therefore use their skills and resources to find workable solutions that are custom made to suit their unique needs. This is why Oakley et al (1998) is of the idea that in order for the development efforts to make sustainable changes in poor people’s lives, they must incorporate local values (Adhiambo, 2012). As Karl (2000) puts it, local people’s judgments of what constitutes success give a more realistic and paramount view about what works and what does not. It is noteworthy that in many rural development programmes, participation is stronger in speech than in reality. There is a lot of lip service to the notion of participation but less commitment to the changes in direction and style that would be required to implement it (Oakley, 1991). The above literature has outlined what participation and partnership entails but the way it has been implemented in African and Kenyan Catholic Church community based projects is virtually left out.

2.2.4 Church Structure and Project Sustainability

While the Church is global, its structures reflect and respect local and national geographic divisions and sensitivities as can be seen in African Church context where diocesan boundaries reside within state boundaries. It also has to work within the legal frameworks set by the Government. The Church’s development personnel liaise with State and Local governments on a regular basis (Morse & McNamara, 2016). The KCCB mandates the Catholic Secretariat to coordinate through its various commissions and implement all the activities which express the mission of the Catholic Church in Kenya. However, The KCCB Is the national action arm of the Catholic Church in Kenya while, the Kenya Catholic Secretariat (KCS) is the administrative centre through which the KCCB implements and coordinates various pastoral programs. It also undertakes those responsibilities which fulfill the mission of the Catholic Church in Kenya. Above all, it carries out the decisions of the Bishops, coordinates the activities of the church, cooperates with the Kenyan Government voluntary agencies and other religious communities, initiates new programmes and services as need arises, and coordinates and manages the national development programmes of the KCCB through various commissions (KCC, 2006).

A study conducted in 2014, to establish roles played by church leaders towards sustainability of health projects in HomaBay, Kenya, indicated that role of church leaders in monitoring and evaluation of community health programs in the district was also looked at. One FGD respondent said, “We don’t know but in our church, development committee meets regularly, so I do think that one of the things they discuss is to review the progress of those programs”. A key informant from Catholic reported that they appraise partners; this was actually verified by a District Medical Officer who later advanced that, churches with operational health facilities were always invited in Annual Operation Plan review meetings like any other partner Catholic, SDA and ACK churches participate in meetings held by partners aligned to them (Okomo et al., 2014).

On planning, the study established that among the churches involved in the study, some had plans for spiritual support to the needy members of the society both in church and at the community level. Another crosscutting finding was that all donors organize for resources, internally and externally, to support their different development projects and programs. Catholic and ACK churches conduct needs assessment as their initial step in planning and also develop proposals to be funded by other development partners. Seventh Day Adventist Church, Catholic and ACK sometimes plan with development partners aligned to them (Okomo et al., 2014). The Catholic Church still obeys its hierarchical and ‘top down’ structure though there have been many proposals to make it more collegial. As the Reformation had a significant impact on governments and monarchies throughout Europe it was equally influential in its empires and colonies worldwide. It follows such rigid structures and bureaucracy to date (Morse and McNamara, 2016). The Catholic Church hierarchy as presented by Morse and McNamara (2016) is: the Rome (Pope), Country (Cardinal), Arch-Diocese/Ecclesiastical Province (Arch Bishop), Diocese (Bishop), Parish (Priest) and Laity (Christian).

Development projects are dealt with within this bureaucracy as the advantage of the Catholic Church development chain in testing analytical frameworks of partnership lies in the universal structures that apply throughout the chain. Given the hierarchical and universal nature of the Church donor organizations in the north are embedded within this structure in the same way as its southern counterparts. As a result each knows the operational context within which the other parts operate (Morse & McNamara, 2016).

The influence of Pope Francis is rippling out across the global Church and Laudato Si’ publication offers us not just an inspiring way forward, but fundamentally challenges our society, the Church and CAFOD as an agency of change (CAFOD, 2016). Sustainability of many development programs in resource limited countries within sub Saharan Africa like Kenya, pose major challenges to most of the governments and the perceived benefitting communities (okomo et al., 2014).

In the 1930s, Kurt Lewin developed a development framework based on leaders’ behaviours and enlisted the following types of leadership behaviours: Autocracy where leaders those who make decisions without consulting their teams. This style of leadership is considered appropriate when decisions need to be made quickly, when there is no need for input and when team agreement is not necessary or honoured for successful outputs or outcomes; Democratic leadership where teams are allowed to provide input before making a decision, although the level of input can vary from leader to leader. This is an important style when and where team agreement matters, but it can be difficult to manage when there are many different perspectives and conflicting ideas; and Laissez-faire leadership where these leaders avoid interfering; typically, they allow people within the team to make most of the decisions. This works well when the team is very able, motivated, and does not need any close observation. However, this can also be seen to mean that the leader is lazy or unfocused, which can cause failure (Murungi et al., 2015).

Researchers have clearly realized that how leaders behave affects their own success and that that a variety of leadership
behaviors may be appropriate at different times (Carpenter, Bauer & Erdogan, 2009; Certo, 2010). They argue that the best leaders are those who can access different behavioral styles and choose the right mode for each situation. A leader works to create emotional bonds that facilitates a feeling of ownership and belonging to the organization. Sometimes the team needs a visionary, a new style of coaching, someone to lead the way or even on occasion, a push. For that reason, great leaders choose their leadership style with calculated analysis of the matters at hand, the end goal, and the best tool for the job. However, though uncompromising, authoritative leaders may inspire an entrepreneurial spirit and vibrant enthusiasm for the mission (Murungi et al., 2015).

Richards and Martin (1981) stress that the best leadership model is the servant leadership where rather than having the right to control others; a servant leader lives his/her life under the control of another. Rather than being greater, a servant spends his/her life ministering among others, training them or showing how the ministry may be carried out without any undue authority over them (Mathew 20: 26-28). However, astudy conducted by Munene (2013) on 187 priests and 58 youth groups in Meru Diocese gave key finding of this study as that the most influential leadership style in attracting the youth to participate in church activities among others is entertainment leadership, trailed by transformational leadership, with charismatic and servant leadership styles coming third and fourth respectively. But what happens on the ground is stack opposite of what the youth prefer as they indicated high preference for entertainment leadership style as opposed to the priests who practice servant leadership style which was lowly rated by the youth. Munene et al. (2013) notes that this causes conflict of interest which is unhealthy for youth projects and that the church should seek ways and means of harmonizing the priests' practice and the youth preference so as to enhance the participation of youth in church and development activities.

As the Church continues to grow and expand throughout the world, the need for effective leadership has increased (Cooley, 2005). This need is being fulfilled by both the clergy and members of their congregation. The Church has consistently taught that all members have the potential to be effective leaders. They must however perceive all leadership positions in the church as an opportunity to serve and not as an opportunity to ‘lord it over’ others and to enrich themselves. This means that those willing to assume ecclesiastical leadership responsibilities must be prepared to do it on voluntary terms, absolutely with no monetary gain (Munene et al., 2013). This leadership styles debate does not indicate how the Nairobi Archdiocese manages its affairs in the community projects. Again it is not shown whether these leadership styles in the church activities are replicated in the community projects. We should also be interested in knowing how the bishops relate with the project teams from the time of allocation of resources to the donor phase off times. Also how the project teams are structured which would influence continuity?

Several research gaps arise from the above review of empirical studies. The empirical studies indicates that research in the area of factors affecting sustainability of community based projects has been done but not in a comprehensive approach. A few studies that have been done have focused on factors affecting sustainability of community based projects on other institutions rather than Catholic Church community based projects. Ondari (2013) carried a study on factors influencing successful completion of road projects in Kenya. The study found management support, design specifications, contractor’s capacity and supervision capacity as factors influencing success completion of road projects in Kenya. Road projects are different from power projects which are part of this study.

Ubani (2012) evaluated the effects of organizational structures on the effective delivery of civil engineering projects in Nigeria. The study found caliber of supervisors/level of lean staffing, level of flexibility, level of authority/power and communication flow, level of accountability and quality oriented index were found to significantly influence success completion of projects. Civil engineering project are different from community based projects in Kenya which are under the study. This study can be criticized that it focused on other projects instead of Catholic Church community based projects. This study therefore intends to fill these pertinent gaps in literature by studying the selected independent variables which are some of factors affecting sustainability of Catholic Church community based projects. This study will add value to the existing literature by providing empirical evidence on the factors affecting sustainability of Catholic Church community based projects with reference to Catholic Archdiocese of Nairobi. It suffices to say that most studies tend to only focus on the religion and economic development. As societies become richer, religion becomes less significant to them and studies also show that there is a strong relationship between secularization and wealth (Peterson, 2007). Most authors contend that studies on the contribution of religious actors in development are a challenge due to lack of data (Ochanda, 2012).

The review of literature reveals that there was limited research on sustainability of donor funded projects. Most research studies focus on donor funded projects on NGOs and whether they are working or operating, capacity building and government involvement than on organizational processes and factors influencing sustainability. Most of the researches conducted on sustainability of NGO funded projects have been conducted in USA, UK and India (Kuria & Wanyoike, 2016). The conditions in these countries vary and may not be the same as in Kenya, ranging from differences in economic conditions to political stability. In Kenya most of the studies done on donor funded projects have been conducted in the Arid and Semi-arid Areas or in marginalized or informal settlements. The conditions in these areas may not be the same as in counties such as Nairobi and Kiambu which are metropolitan in composition.
III. METHODOLOGY

Orodho, (2003) defines a research design as the scheme, outline or plan that will be used to generate answers to research problems. According to Mugenda and Mugenda (2003), research design is the framework or blue print for the research. Research design is a roadmap of how one goes about answering the research questions (Bryman & Bell, 2007). This study adopted a descriptive survey design. A descriptive study is concerned with finding out the what, where and how of a phenomenon (Donald & Pamela, 1998). Creswell (2003) observes that descriptive research design is used when data is collected to describe persons, organizations, settings or phenomena. Descriptive research design was chosen because it enables the researcher to generalize the findings to a larger population. According to Mugenda and Mugenda (1999), the purpose of descriptive research is to determine and report the way things are and it helps in establishing the current status of the population. Constructivist school of thought research paradigm was the philosophical guide for the study.

The Archdiocese of Nairobi is found in two counties which are the Nairobi City County and Kiambu County. It covers an area of 3,721sq. Km and is divided into thirteen deaneries. There are 106 parishes with over 4,000 Small Christian Communities. The Archdiocese serves an estimated population of well over 4 million people where 1.6 million are Catholic faith members. This population is highly cosmopolitan due to the fact that Nairobi city is the capital of Kenya with people from all communities in Kenya and the world at large. Thika sub-county is an industrial centre ranking between 5th and 6th position among the largest towns in Kenya. Other urban centers within the Archdiocese of Nairobi include Kiambu, Ruiru, Juja, Kikuyu, Karuri and Limuru.

The target population in this study comprised of all the Catholic Church community based projects undertaken in Catholic Archdiocese of Nairobi. For each Catholic Church community based project, classified stakeholders who are project beneficiaries, Project Management Committee (PMC) members, project manager, project execution team, donors, and contractors amongst other stakeholders constitute the key informants from which the study sample per project will be selected. The sample size consisted of 10 selected community-based projects in different parishes from 5 out of 13 deaneries in the Archdiocese of Nairobi. Ten project managers from these projects were interviewed whereas a questionnaire was administered to 20% of the said projects’ beneficiaries as indicated in the table below:

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Intervening Variables</th>
<th>Dependent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Allocating financial capital resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Allocation of human capital resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Allocation of physical capital resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management competency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Supervisory skills,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Coordination skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Communication skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stakeholder involvement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Initiation of projects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Implementation and Management of projects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Church structure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Leadership style</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Team structure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Project management administrative staff</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information Technology use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Project management software</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• IT policy and skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Donor face off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sustainability of Catholic Church community based projects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• High income level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Profitability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Improved standards of living</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Meets stakeholder specification</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Archdiocese serves an estimated population of well over 4 million people where 1.6 million are Catholic faith members. This population is highly cosmopolitan due to the fact that Nairobi city is the capital of Kenya with people from all communities in Kenya and the world at large. Thika sub-county is an industrial centre ranking between 5th and 6th position among the largest towns in Kenya. Other urban centers within the Archdiocese of Nairobi include Kiambu, Ruiru, Juja, Kikuyu, Karuri and Limuru.

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The study used questionnaire and structured interviews for the purpose of data collection. The choice of these methods was informed by the many advantages associated with them such as easiness to administer thus time saving and minimization of biases as they may arise from the use of other instruments. The researcher informed the relevant authorities of the intention to undertake this academic research. Also this information was relayed to various Catholic Church Community-Based projects that were affected by the study. According to Creswell (2002), data collection is a means by which information is obtained from the selected subjects of an investigation. The primary data was collected from stakeholders who are project beneficiaries. Both structured and unstructured items will be used in these questionnaires.

The researcher recruited two researcher assistants to undertake data collection process. The researcher assistants deliver the questionnaires physically at the respondents’ places of work. The researcher and the assistants would leave the questionnaires with the respondents and pick them up later. Each questionnaire was coded. The coding technique was be used for the purpose of matching returned, completed questionnaires with those delivered to the respondents.

Before processing the responses the completed questionnaires were edited, coded, entered. Quantitative data was analyzed using descriptive statistics and inferences such as chi square, regression and Spearman’s correlation. Data analysis was done using SPSS (Version 21) and presented through percentages, means, standard deviations and frequencies and in inferential statistics. The information is displayed by use of tables, histograms and bar charts.

Reliability is a measure of the degree to which a research instrument yields consistent results or data after repeated trials (Mugenda & Mugenda, 1999). Reliability in research is influenced by random error. As random error increases, reliability decreases (Mugenda & Mugenda, 1999). From pilot study findings, the researcher will use the most common internal consistency measure known as Cronbach’s alpha (α) for reliability test. It indicates the extent to which a set of test items can be treated as measuring a single latent variable (Cronbach, 1951). The recommended value of 0.7 will be used as a cut-off of reliabilities. This Alpha value was 0.79 for this study.

Validity is the accuracy and meaningfulness of inferences, which are based on the research results (Mugenda & Mugenda, 1999). In other words, it is the degree to which results obtained from the analysis of the data actually represent the phenomenon under study. Patton (2002) define validity as the best available approximation to the truth or falsity of a given inference, proposition or conclusion. Expert opinion was relied on as the measure of validity.

This study adhered to all principles of ethical research. Thus the researcher kept in mind the norms regarding acceptable behaviors before, during and after the study. Among other norms, the research would not subject the respondents or any other persons in the course of this study to any harm in any ways whatsoever. The dignity of all participants was upheld. Furthermore, free consent, privacy and anonymity of the respondents were highly considered. Adequate levels of confidentiality were a priority throughout this endeavor. Lastly, the findings of this research will be disseminated to all interested parties with significant levels of honesty and transparency.

### IV. SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

#### 1.4 Summary of Findings

#### 1.4.1 Management Support

A number of the respondents (42.6%) indicated that top management has very great influence on the financial allocation while 29.6% feel that top management has great influence on financial allocation and sustainability. A proportion of 16.7% indicated that top management has very low influence on financial sustainability. At 7.4% respondents showed that top management has low influence on financial allocations as few of them, 2.7% indicated that there is a moderate influence on financial allocations by the top management. There is weak negative correlation between top management support and financial sustainability in Catholic Church community based projects in the Archdiocese as shown by very low negative correlation, r=-0.247 and its associated high p<0.062. However accept the null hypothesis which states that there is no relationship between financial sustainability and the management support.

On human resource sustainability through top management support, some of the respondents (50%) feel that top management support enhances resources allocation and sustainability at a very great deal. The proportion of 16.7% feels that top management support is important to human resources allocation and sustainability at a great extent. Those who feel that top management support does not have any influence on human resource sustainability compose the lowest number of

### Table 3.1: Sample Size

<table>
<thead>
<tr>
<th>Deanery</th>
<th>Parish/Project</th>
<th>Target population</th>
<th>Sample Size (20%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Thika</td>
<td>St. Augustine</td>
<td>30</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>St. Bernadette</td>
<td>35</td>
<td>7</td>
</tr>
<tr>
<td>2. Ruaraka</td>
<td>Queen of Apostles</td>
<td>42</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>St. George</td>
<td>40</td>
<td>8</td>
</tr>
<tr>
<td>3. Gatundu</td>
<td>Uganda Martyrs</td>
<td>30</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Mary Help of Christians</td>
<td>34</td>
<td>6</td>
</tr>
<tr>
<td>4. Nairobi West</td>
<td>Regina Caeli</td>
<td>33</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>St. John the Evangelist</td>
<td>30</td>
<td>6</td>
</tr>
<tr>
<td>5. Kiambu</td>
<td>Sts. Peter and Paul</td>
<td>38</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>All Saints</td>
<td>40</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>352</td>
<td>69</td>
</tr>
</tbody>
</table>

Source: Archdiocese of Nairobi Office (2016)

www.ijsrp.org
respondents. A proportion of 13% feel that top management has low influence and 11.1% feel the top management influence on human resources allocation is moderate. In total a proportion of 6.9% feel that top management does not have any influence on human resources allocation. The low chi square value of 5.604 and its associated high p<0.231 value indicate that we accept the null hypothesis that there is no independence between sustainability of human resources and the top management support and allocation. Therefore we note that top management has influence on the human resources in the church related projects. Majority of the respondents (57.4%) feel that top management support is important to very great extent for allocation and sustainability of the needed physical resources. This is followed by those who feel that top management support is important to a great extent (20.4%). A very low correlation coefficient, \(r = -0.146\) and its associated high \(p<0.274\) value indicate that there is almost no correlation between top management support and physical resources sustainability. There is a weak negative correlation between allocation of physical resources and support and physical resources sustainability. There is a weak correlation that there is almost no correlation between top management support and allocation. Therefore we note that top management has influence on the human resources in the church related projects.

1.4.2 Management Competency

The regression results indicate that the variances in the dependent variables can be explained 4.3% times by the independent variable-project management training and competence. This is a very low change on the dependent variable from the predictor variable management training. The mutual relationship values indicate weak correlation coefficients on influence of management competency on supervisory skills, \(r = 0.089\), \(r = -0.221\) on coordination skills, \(r = -0.176\) on communication skills and \(r = -0.049\) on contract management skills. These Spearman’s correlation coefficients indicate that there is a weak influence on top management on supervisory, coordination, communication and contract management skills.

1.4.3 Lack of Stakeholders’ Involvement

A number of the respondents (32.8%) indicated that lack of stakeholders’ involvement has led to lack of ownership of the projects. When they do not own these projects, they take them to be alien and success or no success is not a concern. A proportion of 15.5% feel that they did not have to accept projects whose activities they are not involved in as 13.8% indicate that they fail to give important personal experiences for project success when not involved. At 12.1% respondents feel that failure to involve stakeholders scuttles general success of their projects, 5.2% showed that they give their support elsewhere where it is needed and that such projects cannot see change. Few respondents (3.4%) indicated that they cannot give support to such projects. The Spearman rank correlation coefficient values \(r = 0.444\) indicates a positive correlation between stakeholders involvement and the creation of awareness about the projects. It thus means that as stakeholders are left out of the project activities, they will not create awareness and vice versa. A value of \(r = 0.405\) also indicate a positive correlation between involvement of stakeholders and good project planning in the arch diocese. As level of involvement increases, sustainable planning increases in the same proportion. When stakeholders have been well involved the \(r = -0.541\) indicates that the implementation and coordination of project activities reduce in the same proportion. There is very strong positive correlation between stakeholders’ involvement and communication in projects as indicated by \(r = 0.577\). As involvement increases, communicates within and among projects increases in the same proportion. Reduced stakeholders involvement thus reduces awareness creation, planning and communication in the Archdiocese.

1.4.4 Church Structure

Some of the respondents (16.7%), indicated that church structure is important for project sustainability. A proportion of 14.6% feel that it facilitates general management of the project. At 10.4% respondents believe it encourages them to join projects. In equal proportions (6.2%), gives direction to projects, offers good leadership, facilitates sense of responsibility and accountability, shapes decisions and strategies as well as that it facilitates good passage of information follow. Better organization, good command line, provides leadership and guidance follow each with a proportion of 4.2% each.

On church structure and project management, majority of the respondents (51.72%) believe that church structure has been having very great influence on the project management structures in the Arch diocese of Nairobi. This is followed by 20.68% who indicated that the structure has moderate extent in effect on project management. At 6.8%, respondents believe that the church structure has great influence on project management. Few respondents, 5.17%, indicated that the church structure has low level of influence on project management. A low chi square value of 4.090 and its associated probability value of \(p<0.252\) indicate that the two variable are independent of each other and that the church thus influences the project management structures and organization in the Catholic Church community based projects in the Arch diocese of Nairobi.

As far as its influence on project leadership is concerned, majority of the study respondents (56.89%) indicated that the structures have very low level of influence on the project leadership. This is followed by 18.96% of them who indicated that it has very great influence. A proportion of 5.17% indicated that the structure has great influence on project leadership. Few respondents (3.44%) showed that the structure has moderate level of influence on the project leadership. Spearman’s rank correlation, \(r = -0.137\) and its associated probability value of \(p<0.305\) indicate that there is no significant relationship between the church structure and the project leadership. The null hypothesis that states that there is no relation between the church structure and project leadership in the Arch diocese of Nairobi is accepted. As influence of the structure increases leadership capabilities decrease in the same proportion.

Findings on church structure’s effect on project team effectiveness indicate that, a low chi square value of 4.603 and it associated \(p<0.330\) show that the independent and the dependent
variables are independent of each other. This means that church structure’s influence and the project team effectiveness are highly related. This is confirmed by majority of the respondents (55.17%) confirm that church structure has very great effect on the project team. This is followed at a distance by 13.79% who feel it has great influence on project team. Very few respondents (3.44%) indicated that the structure has very low effect on the project teams.

1.5 Conclusions

Despite the reality that most of the of the respondents (42.6%) fell that top management has very great influence on the financial allocation while 29.6% feel that top management has great influence on financial allocation and sustainability, there is weak negative correlation between top management support and financial sustainability in Catholic Church community based projects in the Archdiocese. Very low negative correlation, r= -0.247 and its associated p<0.062 indicate we conclude that there is no relationship between financial sustainability and the top management support.

A number of the respondents (50%) feel that top management support enhances resources allocation and sustainability at a very great deal. The proportions of 16.7% feel that top management support is important to human resources allocation and sustainability at a great extent. A proportion of 13% feel that top management has low influence and 11.1% feel the top management influence on human resources allocation is moderate. Only 6.9% respondents feel that top management does not have any influence on human resources allocation. Since chi square value of 5.604 and its associated high p=0.231 value indicate that we accept the null hypothesis, then we conclude that the top management has significant influence on the human resources in the projects.

It should be concluded that majority of the respondents (57.4%) feel that top management support is important to very great extent for allocation and sustainability of the needed physical resources. This is followed by 20.4% who feel that top management support is important to a great extent. However, a very low correlation coefficient, r= -0.146 and its associated p=0.274 value indicate that there is a weak relationship, support, on allocation of physical resources and the top management support. Though the top management is an important aspect, its support for sustainability of various resources allocation is weak and almost nonexistent in many projects.

Change in the projects which would come from general competence is very low. These Spearman’s correlation coefficients specifies that there is a weak influence of top management on supervisory, coordination, communication and contract management skills. Its influence has been found to be only 4.3% on these important project attributes. In the Archdiocese of Nairobi, there has been involvement of stakeholders in project activities as shown by correlation coefficient values r= 0.444. When adequately involved, users are active in creation of awareness about the projects and vice versa. There has been good project planning facilitated by stakeholders’ involvement. A value of r= 0.405 shows a strong positive mutual relationship between involvement of stakeholders and good project planning in the arch diocese where level of involvement increases and sustainable planning increases in the same proportion. When stakeholders have been well involved the r= -0.541 indicates that the implementation and coordination of project activities reduce in the same proportion.

There was a very strong positive mutual relationship between stakeholders’ involvement and communication in projects as indicated by r= 0.577. As involvement increases, communicates with in and among projects increases also. Increased stakeholders involvement thus increases awareness creation, planning and communication in the Archdiocese. There has been a supportive feeling that church structure positively influences project sustainability. Majority of the respondents (16.7%) indicated that church structure is important for project sustainability, 14.6% feel that it facilitates general project management as 10.4% believe it encourages them to join projects. In equal proportions (6.2%), gives direction to projects, offers good leadership, facilitates sense of responsibility and accountability, shapes decisions and strategies as well as that it facilitates good passage of information follow. Better organization, good command line, provides leadership and guidance follow each with a proportion of 4.2% each.

On project management, majority of the respondents (51.72%) believe that church structure has been having very great influence on the project management structures. This is followed by 20.68% who indicated that the structure has moderate extent in effect on project management. At 6.8%, respondents believe that the church structure has great influence on project management. Few respondents, 5.17%, indicated that the church structure has low level of influence on project management. A chi square value of 4.090 and its p<0.252 indicate that the two variable are independent of each other and that the church thus influences the project management structures and organization in the Catholic Church community based projects.

As far as its influence on project leadership is concerned, majority of the study respondents (56.89%) indicated that the structure has very low level of influence on the project leadership. A proportion of 5.17% indicated that the structure has great influence on project leadership as 3.44% showed that the structure has moderate level of influence on the project leadership. It is thus concluded that there no significant relationship between the church structure and project leadership. This sis shown by Spearman’s rank correlation, r= -0.137 and its associated p<0.305.

Church structure’s effect on project team effectiveness indicates high level influence on project teams’ effectiveness. A low chi square value of 4.603 and it associated p=0.330 show that church structure’s influence and the project team effectiveness are highly related. This is confirmed by majority of the respondents (55.17%) confirm that church structure has very great effect on the project team. This is followed at a distance by 13.79% who feel it has great influence on project team. Only 3.44% indicated that the structure has very low effect on the project teams.

1.6 Recommendations

1.6.1 Policy Recommendations

It is recommended that the project managers should create an environment which is conducive where all users feel part of the team that runs projects. It is also recommended that sources
of finances be made known by the managers to create accountability and transparency. This would enable stakeholders to feel that there is top management support to financial allocation and sustainability as opposed to the current feeling. Though priests may be involved as project managers due to trustworthiness, there should be considerations that those who have appropriate project management as well as soft human relation skills are more suitable. To create more ownership of the projects there should be involvement of user representatives from the initiation to the implementation phases of the projects. This will erase a feeling that these are alien projects which are meant to benefit the initiators and the church alone. A sense of ownership and or belonging is vital to success of the existing and any future church projects.

1.6.2 Recommendations for Further Studies

Further studies should be done on the following: to establish how well the resources have been utilized in the projects which could have improved sustainability, to establish whether communities have been contributing towards the sustainability of their projects through voluntary work, fundraising and through awareness for success and sustainability of these projects, to establish whether the biblical teachings has an effect on the success of the projects and to establish whether there are known economic and political interferences in the success of these projects.

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APPENDIX I: GUIDING TABLES AND FIGURES

Table 1: Managers responses on top management support and the financial sustainability

<table>
<thead>
<tr>
<th>Is top management no support import for sustainability?</th>
<th>Extent-Allocation of financial capital resources</th>
<th>Count</th>
<th>Expected Count</th>
<th>% within Is top management support import for sustainability?</th>
<th>% within Extent Allocation of financial capital resources</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
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<td>.0%</td>
<td>.0%</td>
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<td>% within Extent Allocation of financial capital resources</td>
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<td>39.7%</td>
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<td>% of Total</td>
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<td>3.4%</td>
<td>27.6%</td>
<td>100.0%</td>
</tr>
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</table>

| Total                                                  | Count                                           | 9     | 9.0            | 15.5%                                                       | 100.0%                                                   | 100.0%      |
|                                                       | Expected Count                                  | 6     | 6.0            | 6.9%                                                        | 27.6%                                                   | 100.0%      |
|                                                       | % within Is top management support import for sustainability? | 4     | 4.0            | 27.6%                                                       | 27.6%                                                   | 100.0%      |
|                                                       | % within Extent Allocation of financial capital resources | 16    | 16.0           | 39.7%                                                       | 39.7%                                                   | 100.0%      |
|                                                       | % of Total                                      | 15.5%| 10.3%          | 6.9%                                                        | 27.6%                                                   | 100.0%      |
Table 2: Correlation on top management support and financial sustainability.

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<th>Symmetric Measures</th>
<th>Value</th>
<th>Asymp. Std. Error</th>
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<th>Approx. Sig.</th>
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</thead>
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<td>-1.640</td>
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<td>Ordinal by Ordinal</td>
<td>Spearman Correlation</td>
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<td>-1.907</td>
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</table>

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on normal approximation.

Table 3: Top management support and sustainability of human resource in projects.

<table>
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<tr>
<th>Allocation of human capital resources</th>
<th>very low extent</th>
<th>low extent</th>
<th>moderate extent</th>
<th>great extent</th>
<th>very great extent</th>
<th>Total</th>
</tr>
</thead>
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<td>1</td>
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<td>0.6</td>
<td>0.7</td>
<td>1.9</td>
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<td></td>
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<td>25.0%</td>
<td>25.0%</td>
</tr>
<tr>
<td></td>
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<td>0.0%</td>
<td>25.0%</td>
<td>10.0%</td>
<td>3.6%</td>
</tr>
<tr>
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<td>27</td>
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<td>7.4</td>
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<tr>
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<td>46.6%</td>
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### Crosstab

<table>
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<tr>
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<th>low extent</th>
<th>moderate extent</th>
<th>great extent</th>
<th>very great extent</th>
<th>Total</th>
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<td>1.7%</td>
<td>6.9%</td>
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<td>12.1%</td>
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<td>17.2%</td>
<td>48.3%</td>
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Table 4: Relationship between top management support and sustainability of human resource in projects

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<td>Pearson Chi-Square</td>
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*a. 6 cells (60.0%) have expected count less than 5. The minimum expected count is .34.*

Table 5: Top management support and the allocation of physical resources

<table>
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<tr>
<th>Is top management support important for sustainability?</th>
<th>Allocation of physical capital resources</th>
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<th>low extent</th>
<th>moderate extent</th>
<th>great extent</th>
<th>very great extent</th>
<th>Total</th>
</tr>
</thead>
<tbody>
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<td>0</td>
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<td>25.0%</td>
<td>.0%</td>
<td>.0%</td>
<td>50.0%</td>
<td>25.0%</td>
<td>100.0%</td>
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<td></td>
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<td></td>
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<tr>
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<td>15.4%</td>
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<td>6.9%</td>
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</tr>
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<td>% of Total</td>
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<td>11.1%</td>
<td>3.7%</td>
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<td>3.4%</td>
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<td>93.1%</td>
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<tr>
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<td>Count</td>
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<td></td>
</tr>
<tr>
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<td>% within Allocation of physical capital</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
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<tr>
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<td>resources</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>% of Total</td>
<td>8.6%</td>
<td>10.3%</td>
<td>3.4%</td>
<td>22.4%</td>
<td>55.2%</td>
<td>100.0%</td>
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</tbody>
</table>
Table 6: Strength of the relation of top management support and physical resources sustainability

<table>
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<tr>
<th>Symmetric Measures</th>
<th>Value</th>
<th>Asymp. Std. Error</th>
<th>Approx. T</th>
<th>Approx. Sig.</th>
</tr>
</thead>
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<td>-.849</td>
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<tr>
<td>N of Valid Cases</td>
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</table>

a. Not assuming the null hypothesis
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on normal approximation.

Table 7: Strength of the correlation coefficients between study variables

<table>
<thead>
<tr>
<th>Correlation</th>
<th>Is top management support important for sustainability?</th>
<th>Extent-Allocation of financial capital resources</th>
<th>Allocation of human capital resources</th>
<th>Allocation of physical capital resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spearman's rho</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is top management support important for sustainability?</td>
<td>1.000</td>
<td>-.247</td>
<td>-.065</td>
<td>-.146</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.062</td>
<td>.627</td>
<td>.274</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>58</td>
<td>58</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>Extent-Allocation of financial capital resources</td>
<td>-.247</td>
<td>1.000</td>
<td>.756**</td>
<td>.417**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.062</td>
<td>.000</td>
<td>.001</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>58</td>
<td>58</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>Allocation of human capital resources</td>
<td>-.065</td>
<td>.756**</td>
<td>1.000</td>
<td>.695**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.627</td>
<td>.000</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>58</td>
<td>58</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>Allocation of physical capital resources</td>
<td>-.146</td>
<td>.417**</td>
<td>.695**</td>
<td>1.000</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.274</td>
<td>.001</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>58</td>
<td>58</td>
<td>58</td>
<td></td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).

Table 8: Linear Regression model on managers training and effective management of projects

<table>
<thead>
<tr>
<th>Model Summary</th>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted Square</th>
<th>R Square Change</th>
<th>F Change</th>
<th>df1</th>
<th>Sig. F Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>.207 a</td>
<td>.043</td>
<td>.001</td>
<td>.374</td>
<td>.043</td>
<td>1.031</td>
<td>.321</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), Any project management training?
b. Dependent Variable: Do these project management skills make management task easier?
### Table 9: Correlations between management competency and skills in supervision, coordination and contract management skills

<table>
<thead>
<tr>
<th></th>
<th>Does project management competency affect sustainability of CCc based projects?</th>
<th>Supervisory skills' influence</th>
<th>Coordination skills' influence</th>
<th>Communication skills' influence</th>
<th>Contract management skills' influence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spearman's rho</strong></td>
<td><strong>Correlation Coefficient</strong></td>
<td><strong>Sig. (2-tailed)</strong></td>
<td><strong>N</strong></td>
<td><strong>Cumulative Percent</strong></td>
<td><strong>N</strong></td>
</tr>
<tr>
<td></td>
<td>1.000</td>
<td>.089</td>
<td>-.221</td>
<td>-.176</td>
<td>-.049</td>
</tr>
<tr>
<td></td>
<td>.089</td>
<td>1.000</td>
<td>-.044</td>
<td>.186</td>
<td>.009</td>
</tr>
<tr>
<td></td>
<td>.508</td>
<td>.095</td>
<td>.741</td>
<td>.163</td>
<td>.944</td>
</tr>
<tr>
<td></td>
<td>-0.221</td>
<td>-0.044</td>
<td>1.000</td>
<td>1.638**</td>
<td>0.407**</td>
</tr>
<tr>
<td></td>
<td>-0.176</td>
<td>.186</td>
<td>.638**</td>
<td>1.000</td>
<td>.446**</td>
</tr>
<tr>
<td></td>
<td>-0.049</td>
<td>.009</td>
<td>.407**</td>
<td>.446**</td>
<td>1.000</td>
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</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).

### Table 2: Effects of lack of stakeholder involvement in projects

<table>
<thead>
<tr>
<th>Effect</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>9</td>
<td>1.7</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>Acceptance</td>
<td>9</td>
<td>15.5</td>
<td>15.5</td>
<td>17.2</td>
</tr>
<tr>
<td>Accountability</td>
<td>3</td>
<td>5.2</td>
<td>5.2</td>
<td>22.4</td>
</tr>
<tr>
<td>essential experiences</td>
<td>8</td>
<td>13.8</td>
<td>13.8</td>
<td>36.2</td>
</tr>
<tr>
<td>for success</td>
<td>7</td>
<td>12.1</td>
<td>12.1</td>
<td>48.3</td>
</tr>
<tr>
<td>Ownership</td>
<td>19</td>
<td>32.8</td>
<td>32.8</td>
<td>81.0</td>
</tr>
<tr>
<td>promote growth</td>
<td>2</td>
<td>3.4</td>
<td>3.4</td>
<td>84.5</td>
</tr>
<tr>
<td>provide resources</td>
<td>1</td>
<td>1.7</td>
<td>1.7</td>
<td>86.2</td>
</tr>
<tr>
<td>spreads responsibilities,</td>
<td>3</td>
<td>5.2</td>
<td>5.2</td>
<td>91.4</td>
</tr>
</tbody>
</table>
Table 3: Correlations on how lack of stakeholders’ involvement has affected projects

<table>
<thead>
<tr>
<th>Correlations</th>
<th>Does stakeholder involvement affect sustainability?</th>
<th>Stakeholders factors- Awareness creation</th>
<th>Stakeholder factors- Planning</th>
<th>Stakeholders factors- implementation &amp; coordination</th>
<th>Stakeholders factors- Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spearman's rho</td>
<td>Correlation Coefficient</td>
<td>.444**</td>
<td>.405**</td>
<td>-.541**</td>
<td>.577**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.002</td>
<td>.000</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>58</td>
<td>58</td>
<td>58</td>
<td>58</td>
</tr>
<tr>
<td>Stakeholders factors- Awareness creation</td>
<td>Correlation Coefficient</td>
<td>.444**</td>
<td>1.000</td>
<td>.441**</td>
<td>-.309*</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.001</td>
<td>.018</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>58</td>
<td>58</td>
<td>58</td>
<td>58</td>
</tr>
<tr>
<td>Stakeholders factors- Planning</td>
<td>Correlation Coefficient</td>
<td>.405**</td>
<td>.441**</td>
<td>1.000</td>
<td>.060</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.002</td>
<td>.001</td>
<td>.657</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>58</td>
<td>58</td>
<td>58</td>
<td>58</td>
</tr>
<tr>
<td>Stakeholders factors- implementation &amp; coordination</td>
<td>Correlation Coefficient</td>
<td>-.541**</td>
<td>-.309*</td>
<td>.060</td>
<td>1.000</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.018</td>
<td>.657</td>
<td>.432</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>58</td>
<td>58</td>
<td>58</td>
<td>58</td>
</tr>
<tr>
<td>Stakeholders factors- Communication</td>
<td>Correlation Coefficient</td>
<td>.577**</td>
<td>.633**</td>
<td>.427**</td>
<td>-.105</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.001</td>
<td>.432</td>
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<td></td>
<td>N</td>
<td>58</td>
<td>58</td>
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<td>58</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).
Figure 1: Importance of church structure to project sustainability

Table 4: Extent of church structure importance to project management

<table>
<thead>
<tr>
<th>Chi-Square Tests</th>
<th>Value</th>
<th>df</th>
<th>Asymp. Sig. (2-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>4.090</td>
<td>3</td>
<td>.252</td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>6.107</td>
<td>3</td>
<td>.107</td>
</tr>
<tr>
<td>Linear-by-Linear Association</td>
<td>2.137</td>
<td>1</td>
<td>.144</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>58</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. 5 cells (62.5%) have expected count less than 5. The minimum expected count is .34.

Figure 2: Extent of influence of church structure on project management
Table 13: Extent of church structure influence on project leadership

<table>
<thead>
<tr>
<th>Symmetric Measures</th>
<th>Value</th>
<th>Asymp. Std. Error</th>
<th>Approx. T</th>
<th>Approx. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interval by Interval</td>
<td>-.133</td>
<td>.101</td>
<td>-1.007</td>
<td>.318^c</td>
</tr>
<tr>
<td>Ordinal by Ordinal</td>
<td>-.137</td>
<td>.102</td>
<td>-1.036</td>
<td>.305^c</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>58</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on normal approximation.

Figure 3: Extent of church structure influence on project leadership

Bar Chart

Extent of church structure influence on project leadership
- very low extent
- moderate extent
- great extent
- very great extent

Is church structure important for sustainability of the CCo based projects?

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Table 5: Extent of the church structure effect on the project team effectiveness

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>df</th>
<th>Asymp. Sig. (2-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>4.603^2</td>
<td>4</td>
<td>.330</td>
</tr>
<tr>
<td>Likelihood Ratio</td>
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<td>4</td>
<td>.125</td>
</tr>
<tr>
<td>Linear-by-Linear</td>
<td>3.258</td>
<td>1</td>
<td>.071</td>
</tr>
<tr>
<td>Association</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>58</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a. 7 cells (70.0%) have expected count less than 5. The minimum expected count is .34.

Figure 4: Extent of the church structure effect on the project team effectiveness.
Impediments Facing Elderly Persons in Accessing Cash Transfer Programs in Kiambu Sub County, Kiambu County, Kenya

Joan Thuo¹, Dr. Headmound Okari², Mr. Michael T. Okuku³

¹Masters of Arts in Project Planning and Management, Catholic University of Eastern Africa, Kenya
²,³Supervisor, Faculty of Arts and Social Sciences, Department of Development Studies, Catholic University of Eastern Africa, Kenya

Abstract- This study sought to explore the impediments facing elderly persons in accessing cash transfer programs in Kiambu Sub County, Kenya. The study used descriptive research design with a target population of 977 elderly persons in Kiambu Sub County. A sample size of elderly respondents which represents 10% of the total target population from each of the 6 regions was selected from the target population. The study used both questionnaires and interview guides to get information from elderly persons with the help of research assistants. Quantitative data was analyzed descriptively while qualitative data was analyzed by use of content analysis. The study also used Pearson Correlation Moment method for advanced analysis. The study found that the adoption of mobile money systems, provision of cheques by banks and the payment of cash over the counter has enhanced the accessibility of the CTP by the beneficiaries in Kiambu Sub County. The study further revealed that service locations are distantly situated which has made many beneficiaries to incur transport cost in order to reach the pay point, which in many instances they do not have. It was also established that lack of sufficient information concerning delay of funds, unpredictable means of transport to pay location and their nature of vulnerability to illness due to elderly age impede the accessibility of funds from various service locations in the Sub County. Presence of unclear registration procedures, complexity in nature of mandatory requirements to qualify for the cash transfer, a lack of effective flow of information from providers, lack of clear identification procedures and inadequate community sensitization by various stakeholders were all found to result in the exclusion of many potential beneficiaries from the programs. The study recommends that the government should increase the funding of elderly persons, a comprehensive and practical participatory framework should be developed to provide communities with platform for participating in the program, national and county governments should review the targeting and coordination guidelines of the current cash transfer programs, that both the national and county governments should put structures and mechanism in place to ensure smooth continuation of cash transfer programs in Kiambu Sub County and that various stakeholders should ensure that the stipend is usually regular so that beneficiaries are able to predict and hence plan to expend.

Index Terms- Mode of payment, enrollment procedure, cash transfer programs, service location

I. INTRODUCTION

Cash transfer programming is a popular instrument in the social protection toolbox for livelihood intervention support among the elderly (Jaspars & Harvey, 2013). In the past decade, cash transfers have gained in popularity as a preferred strategy for livelihood intervention support among the elderly persons in different parts of the world. Some have even argued that it can become the solution to the problem of poverty among the older generation.

Some analysts have described cash transfers programs as not only the most necessary, obvious and imperative strategy for poverty alleviation but even suggested that these should replace a great deal of other government activity in order to enhance livelihood intervention support among the elderly in the society (Leomie, Jeffrey & Richard, 2014).

In Mexico, the country started Progresa (Progress) program which was the first cash transfer program experience in the country (Hidrobo, Hoddinott, Peterman, Margolies & Moreira, 2012). Progresa had two primary goals: to improve elderly people education and healthcare and to transfer resources to the country’s poor. Suffice to say, the cash transfer program in the country has also been delved with challenges that emanates from poor planning, improper coordination, frauds, slow dissemination of funds to the elderly as well as distance that are covered by the recipients of the programs (World Bank, 2011).

In Colombia the program was known as the Familias en Acción (Families in Action) program which shares Progresa’s goals of human capital development and poverty alleviation (Turner, Breneman, Milam, Levin, Kohl, Gansneder & Pusser, 2010). Nevertheless, the program has also faced myriad of challenges such as tough guidelines to be a beneficiary, unclear registration procedures and misappropriations of funds by various stakeholders as well as lack of adequate fund to cover for the ever increasing elderly persons (American Institutes for Research, 2016).

In United Kingdom, the use of cash transfers went a level higher after its inception (Aber & Rawlings, 2011). Fajth and Vinay (2010) observed that after the program was extended to elderly persons and also the vulnerable in the society such as those infected with HIV and other diseases that proved expensive to eradicate. As noted by de la Brière and Rawling (2016) the program yields fruits with a couple of years. However, despite its enormous benefits, the program has also experienced barriers that emanated from lack of sufficient servicing channels or

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distribution centers in the interior part of the country (Harvey, 2015).

In Lesotho, the Old Age Pension scheme, benefitting persons aged 70 years and above has had ripple effects in the immediate community through job creation (Lund, 2013) and also led to a reduction in the rates of dependency as well as a high improvement with respect to livelihood among the elderly persons (Waterhouse & Lauriciano, 2015). In 2011, Zambia’s Ministry of Community Development, Women and Child Health (MCDMCH) began implementing the Multiple Categorical cash transfer program (MCP) in two districts (Holmes & Jones, 2013). According to the Monterey County Department of Social Services (MCDSS), the goal of the MCP is to reduce extreme poverty and the intergenerational transfer of poverty especially among the old persons in the community (Davies & Davey, 2015).

In Kenya, the government has in the past two decades placed several measures to protect the rights, social image, livelihoods, vulnerability to poverty and self-development of the most vulnerable populations in the country (Government of Kenya, 2013). The most prominent and successful framework is the social protection where cash transfer program is an integral component (Pearson and Alviar, 2014; Armando, 2016). To strengthen Kenya’s social protection implementation, the National Social Protection Policy was drafted in 2011 and ratified by the Cabinet in May 2012 (World Bank, 2012).

In Kiambu Sub County, the cash program has also gained inroads. The senior citizens of over 70 years old in the county have hailed the government for initiating the social-economic programs among them Inua Jamii which would cushion them against poverty and enable them to take care of basic needs in their homes (Republic of Kenya, 2014). However, the adoption of cash transfer and social protection assistance programs are mostly criticized by politicians and economists on the basis of placing a strain on the economy and also whether such programs are financeable and or sustainable (Gondi, 2009; Ikiara, 2012).

In spite of the benefits, the political goodwill, and despite nearly a decade of cash transfer programs in Kenya especially with specific attention to Kiambu Sub County, the program is still limited in scale and coverage across much of the country remain heavily dependent on donor funding (Mathiu & Mathiu, 2012). More sadly is the fact that since the inception of cash transfer to date many elderly persons mostly in the rural areas have no access to this noble program due to various impediments emanating from mode of payments, location of services, health of the beneficiaries, age of the recipients, enrollment procedures as well as distant to be covered by the beneficiaries.

Again, a close interaction by the researcher with those who are potential beneficiaries reported that many elderly persons have been registered or enrolled into the program but had not received a penny four years down the line. Some also reported to have received less than the required amount. Coupled with the fact that a good number of beneficiaries have in the recent past also complained of lack of consistency in the provision of the funds in the Sub county, the aforementioned loop holes has therefore urged the researcher to carry out a study of this magnitude. This study therefore attempts to fill the aforementioned research gap by explicitly assessing the impediments facing elderly persons in accessing cash transfer programs in Kiambu Sub County and provide recommendations thereof that can be borrowed to enhance its impact on the livelihood of the elderly.

The general objective of the study was to explore the impediments facing elderly persons in accessing Cash Transfer programs in Kiambu Sub County, Kenya. The specific objectives were: to establish how mode of payment impede accessibility of cash transfer programs by elderly persons’ in Kiambu County, to determine how service location impede accessibility of cash transfer programs by elderly persons’ cash in Kiambu County and to assess how enrollment procedure impede on the accessibility of cash transfer programs by elderly persons in Kiambu County.

II. LITERATURE REVIEW

2.1 Critical Review of Relevant Theories

2.1.1 Disengagement Theory

The challenges of old age can also be understood in the context of disengagement theory. The theory, which was developed by Cumming and Henry in late 1950’s, postulates that aging is an inevitable mutual withdrawal or disengagement resulting in decreased interaction between the aging person and others in the social system he/she belongs (Cumming et al., 1961). Under this theory, as people age, they tend to grow more fragile and their social circles shrink as they start to pull away and be less actively involved. Being less active and with decreased ability of the aging person to engage in social relationships or engage in physical activities makes the elderly person susceptible to vulnerability and old age poverty thus the need to subject them to cash transfer programs.

The provision of cash transfers reactivates older persons by making them able to engage in income generating activities, establish or enhance social relationships perhaps through merry go rounds and the like. It makes it possible for them to contribute to meeting household needs of food, shelter and clothing among others. This concurs with Harvighust Activity Theory of 1960's which supports the maintenance of regular activities, roles and social pursuits (Fay, 2014).

The fact that the theory argues that the elderly persons tend to develop decreased ability in engaging in income generating activities that could protect them from poverty; this therefore calls for intervening measures such as the introduction of cash transfer programs that could then help in alleviation of poverty among the elderly persons. Again the usefulness of this theory with respect to this study is the fact that the provision of cash transfer programs could also promote their participation in the provision of basic needs at home, this clearly confirms their active engagement in the family affairs thus does away with unnecessary stress due to a lack of participation syndrome.

Harvighust continues to say that persons who achieve optimal age are those who stay active as roles change the individual finds substitute activities for these roles especially their need to participating provision of basic needs such as food, rent and health services among others. The disengagement approach has been criticized for ignoring the impact of social class on aging experiences. Laura Olson (1982) argued, for example, that the theory's free-market conservative view leaves unquestioned how the class structure and its social relationships

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prevent the majority of older people from enjoying a variety of opportunities or advantages.

2.1.2 Erik Erikson’s Psychosocial Development Theory

Erikson (1963) gives eight stages of human development which every human person undergoes. The stages include Trust versus Mistrust which occurs in infants within the first year of birth, autonomy versus shame and doubt is the second stage. This stage occurs between year 1 and year 3, the third stage is Initiative versus Guilt which takes place at between 3 to 5 years of age, Industry versus Inferiority which occurs between 6 years of age to puberty is the fourth stage, the fifth stage is known as Ego Identity versus Role Identity Confusion which occurs when one is between 10 to 20 years of age, the sixth stage is Intimacy versus Isolation which occurs at between 20 and 30 years of age, the seventh developmental stage is Generativity versus Stagnation. This happens at the age of 40 and 50 years. The eighth and final stage is Integrity versus Despair. This stage occurs at 65 years and above.

However, the current study focused on the eighth stage which is the integrity and despair that occurs above 65 years. The most important event at this stage is coming to accept one's whole life and reflecting on that life in a positive manner. According to Erikson, old-aged adults in this stage deal with reflecting back on their lives. This is the stage when individuals would ask, “What was the point of life?” During this period, the old persons’ experiences a sense of integrity when he/she feels proud of achievements and satisfied with the hand that he/she was dealt with.

With the experience of integrity, the individual has few regrets or recriminations. This, however, is truly possible only if the elderly person has successfully resolved the other seven psychosocial crises. With successful resolution of earlier crises, old-aged people are likely to reflect on their lives positively and attain wisdom even in the face of imminent death. Transitions between previous stages of Erikson’s theory become clearer and feeling at peace with the world and the self becomes more apparent.

On the other hand, people who are unsuccessful in this stage experience despair or disgust. Old-aged individuals feel that they have wasted their lives and experience many regrets. They feel bitterness towards what they were not able to do in their lives, and wishfully hope that they would be able to turn back the hands of time for second chances. It is at this stage that most of the elderly feel disillusioned and not worthy to provide for the family due to their inaction in to actively engage in income generating activities.

According to Kibera and Kimokoti (2015), Erik Erikson’s Psychosocial Theory of Development has a weakness in the sense that it pays more attention to infancy, childhood and adulthood than elderly persons. The stages are meant for the entire lifespan of a human being but Erik does not concentrate much on elderly persons’ life hence it would be important if the theory encompasses in details on the whole human life cycle.

2.2 Review of Empirical Studies

2.2.1 Mode of Payment

Mode of payment can be defined as the means by which a payment is made, such as cash, cheques, or credit card. Harvey (2015) also asserts that mode of payment whereby cash or e-money is delivered could include but not limited to direct delivery whereby cash can be given in envelopes; delivery through banking systems either over the counter, from ATMs or other mobile banking technologies; and delivery using smart cards, debit cards, prepaid cards and point of sale devices and/or mobile phone technologies. Different delivery methods and delivery agents have often been used in combination.

Hanlon and Hulme (2010) states that despite the inception of the cash transfer programs and the technological advancement that exists to enhance the transfer of funds, beneficiaries have always complained that the transfers of funds have never been consistent and that they have never been informed of changes in the bi-monthly payment schedules. Beneficiaries complained of delays in payment ranging between 1 month and 4 months from the expected payment date (Morgan & Kunkel, 2015). The deviation from the schedule mode of payment provided for in the guidelines has multiple negative effects among the needy elderly populations.

In the review of experience in Niger, the mode of payment is by directly delivering cash in envelopes using its own staff of the cash transfer programs remained a common mechanism. This was used also, for instance, by Save the Children in Southern Sudan and by Concern in DRC. In several contexts, agencies had partnered with local traders to assist in the direct delivery of cash. Unsurprisingly, regardless of the delivery option chosen, it is more difficult and more expensive to get cash to people in insecure and remote environments such as Somalia, and DRC Save the Children, 2009).

In Kenya, cash is delivered using a smart card system. Recipients have their fingerprints scanned and receive a smart card that they take to a local agent to get their cash. The local agent uses a point of sale device to verify recipients’ identities (Pearson & Alviar, 2014). People are also able to get their cash from a branch of Equity Bank. In urban slum areas of Kenya, CONCERN and OXFAM in conjunction with the government of Kenya are using mobile phones to transfer cash to the elderly (Momanyi, 2012). Recipients are provided with a SIM card and sometimes a mobile phone, if they do not have one, and they can retrieve the cash at any M-PESA or Airtel money agents (Ahmed, 2015).

According to Croucher, Karanja, Orina, Dokata, Wako and Dima (2016), it is always prudent that various stakeholders within any government should adhere to suitable mode of payment that cannot hamper the delivery of funds to the intended recipients, the elderly. The authors noted that use of cash transfer mechanisms such as adoption of mobile money systems, provision of Automated Teller Machine (ATM) cards, disbursement of funds by cheques and provision of liquid funds by means of envelopes are some of the convenient mode of payment that a government can adopt depending on the location of the recipients.

According to O’Donnell (2013), the government of Kenya has a schedule of the distribution of funds from the host Ministry to all relevant clearance points and to the service points in the intervention areas so as to enhance the delivery of payment to the old persons effectively and efficiently. However, in some instances the mode of payment may change due to transactional system breakdown whereby the elderly persons could be asked to
receive funds in cash rather than the traditional electronic payment systems. The recipients are then requested to countersign against their names as an indication that the funds are received.

According to Croucher et al. (2016), resorting to manual transaction is always attributed to the fact that service providers never at any time want the recipients to fail to get their funds on timely basis. Though some researchers have questioned the credibility of the manual cash transfer programs to the elderly in spite of the fact it is meant to avail funds on time. Mwiti and Kukrety (2014) argues that in some instances, some beneficiaries reported ever receiving bulk cash to a maximum of over Kshs 20,000 an equivalent to one year backlog payment. Given that all beneficiaries are poor, planning for such huge amounts is difficult and reduces the value and importance of the bi-monthly transfer scheme. Some beneficiaries end up spending the money on non-priority items with the hope that in the next two months a similar transfer would happen.

Again as Mathiu and Mathiu (2012) states, some caregivers took advantage of the situation and diverted the funds to other uses which then exposed the elderly to malnutrition as a result of lack of proper diet or failure to get food on daily basis. It is therefore prudent that the mode of payment adopted to enhance the access of funds should be reliable and consistent to reduce the chances of the elderly being subjected to life threatening calamities.

2.2.2 Service Location

The location of services is very significant in the quest by the elderly persons to access funds on timely basis. This also goes in tandem with the availability of the facilities or pay points that provide them with funds. According to Glaeser (2012), the available pay points as stated above are sometime distantly located which has in most cases affected the accessibility of the funds. Glaeser argues that beneficiaries have no choice but to travel to cash collection points despite their age or condition, this is worsened by the fact that most post offices and banks are located which has in most cases affected the accessibility of the benefits. Glaeser and Adams (2009) says that some beneficiaries have pointed out that the payment centers are located in urban areas and market centers which therefore make the accessibility of cash transfer funds a challenge.

Additionally, Lor-Mehdiabadi and Adams (2009) says that some beneficiaries have pointed out that the payment centers are located far from the residence of the older persons. For example, in counties where transport infrastructure is less developed, and the terrain is difficult the beneficiaries reported incurring high transport costs estimated in some areas at Kshs 3000, a figure higher than the monthly allowance. In such cases, the beneficiaries feel discriminated through physical location of services and hidden costs. Such factors thus diminish the overall value and benefit of the program consequently exposing older persons to life related challenges.

Leonie et al. (2014) also asserts that beneficiaries and mainly the older persons have always complained of lack of information concerning the arrival of funds at various payment points and sometimes they could travel long distance just to return home empty handed. The authors says that Posta pay, the most common means of payment which normally provides 10 days period for the collection of the funds in some cases lacks funds even within the stipulated grace period of collection. All these cost summed together portrays the programs as more costly to the older persons consequently the need for more pay point to be initiated in strategic positions in order to hasten and enhance the access of the cash transfer programs.

In support, Duyne (2016) reasons that some beneficiaries living far from the collection points and who do not get the correct information on the arrival of fund sometimes missed the funds upon expiry of grace period allocated while others wasted transport fee to travel to the service points in vain. Duyne (2016) note that another challenge associated with the delay is that information was not provided to beneficiaries as to when the funds would be received at the point where services are located.

The lack of information therefore made it difficult for beneficiaries to plan, budget or negotiate for services that are accessed in far places which in most cases involves costs such as transportations and to some extent food related expenses. The study at hand therefore tends to find out the factual effect of service location on the accessibility of cash transfer funds among the older persons.

In Senegal, the location of pay points has made it harder for those in remote areas to access funding programs. Due to the ageing characteristics of the older persons, they are more susceptible to helpers or guardians who more often than not remit to the beneficiaries less cash upon being delegated duty of collecting the funds on behalf of the elderly as a result of far distantly located pay points. Due to this, the use of cash transfer was suspended in 2011 after the beneficiaries were noted to be falling prey to unscrupulous business and middlemen as well as helpers while some money were misappropriated by some of the aid and Government authorities. It is for this reason that the government considered initiating more service points mostly in rural areas whereby the beneficiaries will be able to access the funds (Drèze, 2010).

According to Momanyi (2012), the accessible the facilities, the more accommodative and reliable the fund transfer programs and vice versa. As indicated by Blank (2012) majority of the older persons more often than not are unable to access funds on time as a result of long distance that they have to cover as and when go for payment. To a large extent some have to cater for transportation cost and the fact that they are aging and vulnerable to diseases has also negatively made their movements to the pay point a tall order.

According to Creti and Jaspars (2015), in vast rural counties where post office and banks are concentrated in the urban areas, the care givers and beneficiaries incurred transport costs to obtain the money. In support, Government of Kenya (2010) audit results show that a majority of the beneficiaries obtained the fund from the Postal Corporation of Kenya and Equity bank payment service providers.

2.2.3 Enrollment Procedure

The goal of the cash transfer is to strengthen the capacity of poor households, mainly the elderly persons to ensure they receive basic care within families and communities. However, this program has faced myriad of challenges that emanates from unclear registration and enrollment procedures with respect to mandatory acceptable documentation for membership. All these have been attributed to lack of information flow from the providers to the potential recipients thus many beneficiaries’
remains in the dark in terms of enrollment procedures (Coady, 2014).

According to World Bank report (2012), most of the beneficiaries and caregivers admitted that they first heard about the program through a word of mouth from chief ‘barazas’ through community social meetings. Only a small fraction reported ever being contacted in person by a designated program agent officer such as a member of the local committee or their equivalent.

Lofvall (2012) opines that there is however some incidences particularly in the vast hardship sub-counties where the beneficiaries and care givers had little or incorrect information about the enrollment and who relied heavily on their friends and relatives to obtain information about the cash transfer programs. As a matter of fact, without proper and well-coordinated promotional education for the community about the program by various stakeholders, most potential beneficiaries and caregivers in the community are likely to hold inaccurate information about the procedures, objects and value for the cash transfer programs thus minimizes their chances of becoming recipients.

On the other hand, Ressler (2015) points out at the need for clear minimum criteria used for the identification of the beneficiaries. He argues that lack of clarity about the identification, recruitment and enrollment of beneficiaries may be an outcome of inadequate levels of engagement of the beneficiaries in the implementation of the program or lack of adequate community sensitization about the entire programs. He suggest that developing countries could also borrow a leaf from developed countries who have properly bank rolled the cash transfer by employing qualified and adequate staff who conducts door to door seminars and campaigns to create awareness among the community members. The stakeholders are normally equipped with government led materials which clearly stipulates the enrollment procedures for the beneficiaries as well as the role played by any care giver to the older persons. All these mechanisms thereby should be put in place to enhance the accessibility of cash transfer funds among the older persons in the society.

In order to enhance, enrollment programs, Schubert (2015) as well states that beneficiaries who qualify for the cash transfer programs should be provided with a beneficiary’s identification card (BIC) showing their names, place of residence and type of Cash Transfer Programs (CTP) program they are enrolled in. According to him, the personal identification card is a necessary tool for self-identification of beneficiaries at the pay service points, for ease of monitoring of the program beneficiaries (number, distribution, coverage), and can be used by the beneficiaries or caregivers to obtain necessary approved waivers in other developmental programs.

As opined by Blair (2012), the stakeholders in the cash transfer program in any country should also ensure that all enrolled beneficiaries are provided with Beneficiaries Identification Card (BIC) as provided for in the guidelines to remove any perceptions of inequities among the beneficiaries. The BIC will also increase the level of ownership of the program among the beneficiaries and increase confidence that all persons enrolled in the program will remain in the government register and payroll as long as they continue to adhere to the conditions set. In a nutshell, adoption of beneficiaries’ enrolment programs as well as procedures will enhance the accessibility of cash transfer programs and thereby improve the livelihood of the elderly in the society.

In southern Africa alone, with specific attention to Lesotho, there are noncontributory social pension schemes designed to provide cash transfers to elderly members of the society (Deveraux, 2012). In all these cases, the attention has been focused to the role of cash transfers in promoting development among the poor citizens (Ellis, Mvula & Devereux, 2009). It is therefore worth noting that there are various forms of social protection transfer, notably cash transfer, voucher transfer, and the transfer of good and materials. However, the difficulties faced by many of the beneficiaries are the fact that the various governments have tedious enrolment and registration procedures which has sadly excluded many potential beneficiaries from the cash transfer programs.

Ellis, Mvula and Devereux (2009) argue that lack of clarity on the identification and enrolment of beneficiaries may be an outcome of inadequate levels of engagement of the beneficiaries in the implementation of the program or lack of adequate community sensitization about the entire programs. Another reason for low enrollment is attributable to lack of adequate officers who could enlighten the public or organize door to door campaigns to create awareness.

In Kenya, a study conducted by Amando (2016) agrees with the foretasted position and show that only a few of the older persons were aware of existence of other program agents such as members of the local ward committee but shockingly lacked full awareness on the requirements to be a beneficiary. The author also noted that the lack of information flow from the providers to the potential recipients has hindered the registration of many beneficiaries in the country. Many beneficiaries’ have therefore remained in the dark in terms of enrollment and rules of engagement into the cash transfer program procedures. There is enough evidence therefore to commend the program for utilization of the local machinery to enroll needful populations as well as enlightening the community on the procedures and processes of the cash transfer programs.

Again, in Kenya most of the beneficiaries and caregivers have reported that they learned about the components of the programs through community social meetings particularly the chiefs’ barazas. There are however some incidences particularly in the vast hardship sub-counties where the beneficiaries and care givers had little or incorrect information about the intervention and who relied heavily on their friends and relatives to obtain information about the CT.

However, without proper and well-coordinated promotional education for the community about the program, most potential beneficiaries and caregivers in the community are likely to hold inaccurate information about the objects and value for the cash transfer programs. There is enough evidence therefore to commend the program for utilization of the local machinery to enroll needful populations.

### 2.3 Summary and Research Gaps

As evidenced in the empirical studies, the cash transfer programs has played significant role in the uplifting of livelihood in both developing and developed countries. However, it is clear

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that the level of participation of the communities and beneficiaries in the cash transfer program is significantly low. This is attributed to the fact that many beneficiaries are not aware of the formal structures of engagement with the components of the program.

Studies show that beneficiaries’ faces some challenges during the implementation of the cash transfer. Some cited lack of correct and adequate information on the processes of enrolling into the program; not being supplied with beneficiary identification card that facilitates recipients to obtain the transfer and enjoy other social protection services; delay and unpredictable transfers of the funds leading to poor planning inconveniences, increased vulnerability; unforeseen expenditures associated with payments such as transport costs due to distantly located pay points, the mode of payment that are available which sometimes delays the reimbursement of funds on time and also diminishing value of the funds due to high cost of living and diverted use of these resource by the care givers.

The mentioned difficulties impact negatively on the quality, efficiency and effectiveness of the cash transfer programs among the older persons. The study at hand is therefore significant as it investigated the impeding elderly persons’ faces in the accessibility of cash transfer programs in Kiambu Sub County.

From the above review of global, regional and national literature level studies, several research gaps have been identified. Most of the studies reviewed in this chapter are from developed countries whose strategic approach and financial footing on cash transfer programs is different from that of Kenya. The dissimilarity in strategic approach is also driven by the fact that the geographical set up as well as administrative aspects of the cash programs of the reviewed countries varies from Kenyan situation thus a need for a study of this magnitude that is hinged on the country set up.

It was also noted by the researcher that none of the reviewed studies specifically focused on Kiambu Sub County which is among the regions in the country that has immensely benefited from the cash program as indicated by the presence of beneficiaries in the region. Again none of the studies carried in other regions used variables incorporated in this study such as; service location, mode of payment and enrollment procedures and government policies. As indicated above, there is therefore a literature gap that has prompted the researcher to carry out a study based on the impediments facing elderly persons in the accessibility of cash transfer program in Kiambu Sub County and provide recommendations thereof that could bridge the existing study gaps.

III. METHODOLOGY

Lewis (2015) describes a research design as an arrangement of conditions for collection and analysis of data in a manner that aims to combine relevance with the research purpose. It specifies the methods and procedures for the collection, measurement, and analysis of data. The study used mixed research approach which consisted of both quantitative and qualitative data. The approach was preferred because it was able to expand the findings of the study by deeply gathering information with the help of both questionnaires and interview guide in a way that a single approach can’t. Therefore, its process of offering a statistical analysis, along with thematic approach made the approach more comprehensive and useful for the success of the current study.

The current study also used descriptive survey research design. The design was also preferred because it was able to provide a high level of general capability in representing a large population. Due to the usual huge number of people who answers survey, the data being gathered possess a better description of the relative characteristics of the general population involved in the study. As compared to other methods of data gathering, descriptive survey was able to extract data that are near to the exact attributes of the larger population thus its significance to the current study.

Kiambu Sub County is part of Kiambu County which is one of the 47 Counties in the Republic of Kenya. It is located in the central region and covers a total area of 543.5 Km² with 176.3 Km² under forest cover. Kiambu Sub County borders Nairobi and Kajiado Counties to the South, Machakos to the East, Muranga to the North and North East, Nyandarua to the North West, and Nakuru to the West. The Sub County lies between latitudes 00 25’ and 10 20’ South of the Equator and Longitude 360 31’ and 370 15’ East. Kiambu Sub County has a population of 188,112 (KNBS, 2016).

Lazar, Feng and Hochheiser (2017) defines target population as the population to which a researcher wants to generalize the results of the study. Basically it is the universal set of the study of all members of real or hypothetical set of people, events or objects to which an investigation wishes to generalize the results. The study population therefore was all the 977 elderly persons in Kiambu Sub County.

A sample can be defined as manageable version of a larger group or populace selected for data collection to yield estimates on behalf of the whole population (MacCallum, 2016). Sampling is necessary in research because a researcher usually cannot gather data from the entire population, therefore by taking a sample that is representative of the population saves the researcher resources in terms of time and money. The sampling started by selecting randomly an element from the list and then every kth element in the frame was selected, where k is the sampling interval. This was calculated as k=N/n where n was the sample size and N was the population size (Cooper & Schindler, 2013).

The sampling technique that was chosen for this study was stratified random sampling which is a form of probability sampling to select the respondents. Stratified random sampling involved a deliberate selection of particular unit of population to constitute a sample representing the population. A sample size of respondents which represents 10% of the total target population (977) from each of the 6 regions was selected from the target population. The 10% threshold was supported by Neuman (2013) who stipulates that a sample size of 10-20% of the target population is representative enough and could provide sufficient information on behalf of the total target population. The sampling frame is as indicated in table 3.1.
The study used drop and pick methods for quantitative data while the qualitative data in the form of interview guide was based on one-on-one interview with the selected respondents. Data collection is gathering empirical evidence in order to gain new insights about a situation and answer questions that prompt undertaking of the research (Cresswel, 2013).

The study utilized primary data. Primary data is the data observed or collected directly from first-hand experience. The primary data was used because it presents original conclusions based on the research of others, or the fact that an author's original perspective more helpful and effective for research needs. It was also advantageous because it allowed the researcher to interpret the information rather than relying on the interpretations of others. Primary data was therefore collected using constructed questionnaires and interview guide.

The questionnaires were divided into four parts that helped the researcher meet the objectives. The first part contained personal information from the respondents. Part two sought information on how mode of payment affects elderly persons’ accessibility of cash transfer programs. Part three sought information on how service location to pay point affects elderly persons’ accessibility of cash transfer programs in Kiambu County. Lastly, section four was based on enrollment procedures for the elderly persons in accessing of cash transfer programs.

In order to incorporate more responses from the elderly persons, the study utilized the interview guide. According to Doody and Noonan (2013), interview guides combine questioning, cross-examination and probing. Coakes and Steed (2011) further defines cross examination as interrogating participants by means of questions, asking questions from different angles in order to elicit the truth of the testimony and of the matter being considered. Owens also defines probing as means of digging deeper into the questions to get more details about the problem.

In this study, cross examination and probing was employed to elicit information from the respondents. The unstructured one-on-one interviews were conducted through visiting the sampled respondents. The researcher used interview guide because it provided highest cooperation of the respondents and since the respondents had to be present, the method was suitable because it provided an opportunity for clarification.

Validity is the degree to which results obtained from the analysis of the data actually represent the variables of the study (Spangler, Liu & Hill, 2012). The researcher validated the questionnaire by asking research experts, in this case, the university supervisors were able to read and advise the researcher to readjust the instruments appropriately in order to enhance the representation of the variables in the set questions. The feedback by experts was used by the researcher to modify the instruments to ensure validity during the main data collection process.

A pre-test of the research instrument using a few constructed instruments was conducted in other area, Thika Sub County for various reasons: It helped to clarify the wording and grammar of the instrument so as to remove any ambiguity, detected biased questions and picked out in advance any problems in the methods of research before embarking on main data collection exercises.

Reliability is about demonstrating that operations within the study, such as data collecting procedures, can be repeated with the same results being obtained by another researcher. The goal of reliability is to minimize errors and biases in the case study. Yin (2013) notes that one way to deal with the issue of reliability is to document the procedures followed in the case. Reliability in quantitative research is based on trustworthiness.

With regard to reliability of questionnaire, Cronbach’s Alpha reliability coefficient method was calculated using Statistical Packages for Social Sciences (SPSS) version 21. George and Mallerly (2013) argue that if the statistical Alpha is equal or greater than 0.5 the questionnaire scale is considered reliable hence can be used for the analytical procedures. The reliability results presented in table 3.2 shows that a Cronbach’s Apha of 0.671 was obtained which therefore an indication that the scale was reliable for data analysis processes.

<table>
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<tr>
<th>Table 3.1: Sampling Frame</th>
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<th>Table 3.2: Reliability Statistics</th>
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<tr>
<td>Cronbach's Alpha</td>
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<td>.671</td>
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The collected data was edited and cleaned for completeness in preparation for coding. Once coded, the data was entered into Statistical Package for Social Sciences (SPSS) version 21. The quantitative data was then analyzed descriptively. The data was then interpreted to give relevant meaning to the findings. Meanwhile qualitative data was analyzed by use of content analysis where results were arranged into homogeneous groups or themes for ease of presentation.
The study also used inferential statistics known as Pearson Correlation Moment method for advanced analysis to compare the relationship between mode of payment, service location, enrolment procedures and government policies, health and age and the dependent variable (Accessibility of Cash Transfer). Correlation was preferred because it helped to describe variables in measures of central tendency and dispersion hence provided results required to meet the objectives of the study. It also helped to ascertain the significant relationship between two variables under study.

Correlation was denoted as r, and it took a range of values from -1 to +1. A value of 0 denotes that there is no positive relationship between the two variables. A value greater than +1 indicated a positive association, that is, as the value of one variables increases so does the value of the other variables. A value of -1 indicated a negative association, that is, as the value of one variable increases the value of the other variable decreases (Kumar, 2015; Counsell, 2013).

According to Koibori (2014), ethics deals with one’s conduct and serves as guideline to one’s behavior. The researcher ensured that ethical concerns were put into consideration during the time of the study. Confidentially of the respondents was assured by making sure that none of them wrote or gave his/her name in the questionnaire or the interview schedule and the interviewer was never disclosed to them. This helped the respondents to give honest information. The researcher also applied for data collection permit from the National Commission for Science, Technology and Innovation (NACOSTI). This permit also enhanced the participation of respondents since they were able to determine the need for the research study.

The researcher endeavored to acquire informed consent by explaining to the respondents the purpose of the research study. The respondents were informed that they had free choice to participate or not. They were not coerced or forced to participate in the study for whatever reasons. They were free to answer or not to answer any question in the questionnaire and interview guide. This was done to ensure that the respondents were not subjected to any physical or psychological harm in the process of giving information for the study.

The findings were reported as outlined by the respondents without changing or falsifying the information. Threatening and embarrassing questions or statements were avoided by the researcher. Academic freedom was assured so that respondents were able to openly express their ideas and freely discuss them with the researcher. Finally, the researcher acknowledged all the work of others which have been cited to avoid plagiarism.

Regarding the effect of mode of payment on elder persons’ accessibility of cash transfer programs, the study found that respondents had a disagreement level of 70% disagreed and strongly disagreed respectively that the mode of payments that are available to enhance cash transfer programs can be termed as effective. The study also found that the adoption of mobile money systems by providers of cash transfers has enhanced the accessibility of funds as supported by 68% agreement level.

The study found that respondents had been provided with ATM cards to enable access of funds on timely basis as reported by an agreement level of 62%. Further, the study found that respondents have sometimes received funds by means of cheque from the banks as revealed by a respondents’ agreement level of 84%. The study also found that most respondents had ever been provided with liquid cash in an envelope direct from pay point as supported by 86% agreement level by respondents.

Again, the study found that respondents have ever been paid over the counter from bank or Posta pay as indicated by an agreement level of 56% by respondents. The data finally found that there was an agreement level of 78% that beneficiaries have ever failed to get funds upon visiting pay point which has led to disbursement of funds in lump sum as and when funds are available.

4.1.2 Service Location
Regarding the effect of service location on elder persons’ accessibility of cash transfer programs, the study established that the location of respondents’ place of residence to the pay point is very far as reported by an agreement level of 69%. Again the study found that beneficiaries always incurred transport cost in order to reach the pay point as reported by 70% respondents’ agreement level.

The study further found that many beneficiaries have ever failed to access funds because of lack of transport fee to the pay point as supported by agreement level of 75%. Further the study found that lack of information concerning delay of funds sometimes leads to incurring of transport cost just to miss funds at the pay point as represented by an agreement level of 71%.

It was also found that unpredictable means of transport from place of stay has always made access to funds challenging as reported by respondents agreement level of 84%. It was also found that respondents sometimes failed to access cash as a result of vulnerability to illness due to old age as supported by an agreement level of 87%.

4.1.3 Enrollment Procedures
Regarding the effect of enrollment procedures on elder persons’ accessibility of cash transfer programs, the study found that presence of unclear registration procedures has been a challenge to many potential beneficiaries of CTP as reported by an agreement level of 83% of the beneficiaries. The study found that mandatory requirements to qualify for the cash transfer programs are always complex as supported by an agreement level of 67% by respondents.

The study further found that lack of effective flow of information from providers has left many potential beneficiaries out of the program as supported by 88% agreement level by beneficiaries. It was also found that lack of clarity on identification procedures has led to inadequate enrolment of elder persons as reported by high agreement level of 83% by respondents. The study also found that lack of community
sensitization has left many possible beneficiaries out of the program as reported by 69% agreement level by the beneficiaries. The study finally found out that Government has provided elderly persons with beneficiaries’ identification cards (BIC) to enhance access of funds as indicated by an agreement level of 85%.

4.2 Conclusions

The findings as presented in the previous chapter evidently indicates that the various indicators under each of the three objectives if not fully adopted and implemented may jeopardize the accessibility of cash transfer programs in Kiambu Sub County which therefore could expose the elderly persons to a feeling of lack of belonging, self esteem in the society and worse scenario the inaccessibility of cash transfer funds could create room for exposure to abject poverty among the elderly persons. Based on the findings in the previous chapter, the study arrives at the following conclusions;

4.2.1 Mode of Payment

The study concludes that the adoption of mobile money systems, the provision of cheques by banks, payment of cash over the counter has enhanced the accessibility of the CTP by the beneficiaries in Kiambu Sub County. However, a good number of respondents termed the utilized mode of payment as challenging due to their educational background as well as the fact that some beneficiaries complained of failures to get funds as scheduled due to delay.

4.2.2 Service Location

The study concludes that the service locations are distantly situated which has made many beneficiaries to incur transport cost in order to reach the pay point, which in many instances they do not have. It was also established that lack of sufficient information concerning delay of funds, unpredictable means of transport to pay location and their nature of vulnerability to illness due to elderly age impede the accessibility of funds from various service locations in the Sub County.

4.2.3 Enrollment Procedures

The study concludes that presence of unclear registration procedures, complexity in nature of mandatory requirements to qualify for the cash transfer, a lack of effective flow of information from providers, lack of clear identification procedures and inadequate community sensitization by various stakeholders has led to the exclusion of many potential beneficiaries from the programs. However, the outstanding issue was that the Government has provided elderly persons with beneficiaries’ identification cards (BIC) to enhance access of funds in Kiambu Sub County.

4.3 Recommendations

The study recommends that the government should increase the funding of elderly persons’ cash transfer programs to avoid delays in the programs. The study also recommends that institutions should engage in training of staff to increase competency and ensure there is administrative capacity to carry out targeting and paying of the older persons’ cash transfer programs.

The study recommends that a comprehensive, practical participatory framework should be developed to provide communities with platform for participating in the program. This should include mechanism and structures for public engagement in the design through campaigns, recruitment and vetting of the administrators and beneficiaries, conduct of fiscal audits, and benefit evaluation of the intervention.

The study further recommends that the implementing agencies should roll out an intensive well-coordinated public education program to sensitize the communities, administrators and all other stakeholders of the objects, value and process of implementation of cash transfer programs. Public education need to be regular and with consistent messages.

It is also recommended the national and the county governments should have an opportunity to review the targeting, coordination and implementation guidelines of the current cash transfer programs. These reviews should consider principles of devolution and provisions of legislations frameworks such as the Social Assistance Act of 2013 to inform the scale up phase and establishment of a comprehensive, affordable and sustainable social safety network program in national and county levels.

It is again recommended that both the national and county governments should put structures and mechanism in place to ensure smooth continuation of cash transfer programs in Kiambu Sub County. This includes putting enough human resources and facilities at national and county level to ensure seamless delivery of services.

The study also found that the stipend is not always regularized as the guideline stipulates, though it is backdated to the previous payment in the event that the cash is delayed. A recommendation is made to various stakeholders to ensure that the stipend is usually regular so that beneficiaries are able to predict and hence plan to expend.

4.4 Areas of Further study

The study focused on the impediments facing elderly persons in accessing Cash Transfer programs in Kiambu Sub County, Kenya. The researcher therefore proposes that another study should be carried out to determine the factors influencing management of elderly person’s cash transfer programs in Kiambu Sub County. The fact that this study focused only in Kiambu Sub County, the researcher proposes that a similar study can be carried out in Kenya to come up with conclusive national recommendations in order to promote accessibility of the cash transfer programs.

REFERENCES


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APPENDIX I: REFERENCE TABLES AND FIGURES ON RESEARCH FINDINGS

Figure 4.1: Distribution of Respondents by Gender

Figure 4.2: Distribution of Respondents by Duration as CTP Beneficiaries


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Third Author – Mr. Michael T. Okuku, Supervisor, Faculty of Arts and Social Sciences, Department of Development Studies, Catholic University of Eastern Africa, Kenya
Table 4.1: Mode of Payment on Elder Persons’ Accessibility of Cash Transfer Programs

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree (%)</th>
<th>Disagree (%)</th>
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<tr>
<td>The mode of payments that are available to enhance cash transfer programs can be termed as effective</td>
<td>17</td>
<td>53</td>
</tr>
<tr>
<td>The adoption of mobile money systems by providers of cash transfers has enhance the acquisition of funds</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>I have been provided with ATM cards to enable me access funds on timely basis</td>
<td>14</td>
<td>17</td>
</tr>
<tr>
<td>I have sometimes received funds by means of cheque from the bank</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>I have ever been provided with liquid cash in an envelope direct from pay point</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>I have ever been given paid my funds over the counter from bank or Posta pay</td>
<td>12</td>
<td>19</td>
</tr>
<tr>
<td>I have ever failed to get funds upon visiting pay point which has led to disbursement of funds in lump sum</td>
<td>5</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 4.2: Service Location on Elder Persons’ Accessibility of Cash Transfer Programs

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree (%)</th>
<th>Disagree (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The location of my place of residence to the pay point is very far</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>I always incur transport cost in order to reach the pay point</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>I have ever failed to access funds because of lack of transport fee to the pay point</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Lack of information concerning delay of funds sometimes leads to incurrence of transport cost just to miss funds at pay point</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Unpredictable means of transport from place of stay has always made access to funds challenging</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>I sometimes fail to access my pay as a result of vulnerability to diseases due to old age</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.3: Enrollment Procedures on Elder Persons’ Accessibility of Cash Transfer Programs

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree (%)</th>
<th>Disagree (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence of unclear registration procedures has been a challenge to many potential beneficiaries of CTP</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>The mandatory requirements to qualify for the cash transfer programs are always complex</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Lack of effective flow of information from providers has left many potential beneficiaries out of the program</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Lack of clarity on identification procedures has led to inadequate enrolment of older persons</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Lack of community sensitization has left many possible beneficiaries out of the program</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Government has provided old persons with beneficiaries identification cards (BIC) to enhance access of funds</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>
Table 4.4: Pearson Product Moment Coefficients

<table>
<thead>
<tr>
<th>Mode of payment</th>
<th>Mode of payment Pearson Correlation</th>
<th>Service location</th>
<th>Enrollment procedures</th>
<th>Cash transfer program</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>71</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service location</td>
<td>Pearson Correlation</td>
<td>.155**</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>N</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>71</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enrollment procedures</td>
<td>Pearson Correlation</td>
<td>.193**</td>
<td>.189</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>N</td>
<td></td>
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<td>71</td>
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<tr>
<td></td>
<td>71</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash transfer program</td>
<td>Pearson Correlation</td>
<td>.645**</td>
<td>.715**</td>
<td>.441**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>N</td>
<td></td>
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<tr>
<td></td>
<td>71</td>
<td></td>
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</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).
Impact of Strategic Responses on the Performance of Oil Marketing Companies in Kenya

Leonard Muchiri¹, Dr. Kepha Ombui², Prof. Mike A. Iravo³

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²,³Supervisor, Department of Human Resource Development, Jomo Kenyatta University of Agriculture and Technology, Kenya

Abstract- The objectives of this study were to determine the strategic responses adopted by Oil Marketing Companies in Kenya and to establish the influence of strategic responses on performance of Oil Marketing Companies in Kenya. The research used a descriptive case study to determine the strategic responses adopted by OMCs, Kenya. A survey was used to describe the strategic responses which were successfully applied at OMCs so as to improve performance. The target population for the study was 216 employees working at OMCs and the sample size was 115 employees. The study used primary sources of data. Primary data was collected using both open-ended and closed-ended questionnaires. The instruments were self-administered to the respondents using a drop and pick later method. Data analysis was done using Statistical Package for Social Sciences (SPSS). This involved both quantitative and qualitative data analysis. Numerical data was collected from large sample, representative samples structured questions and interviews were analyzed using simple statistical methods whereby frequency distribution and percentages were widely used for study conclusions. The study concluded that the most popular strategic responses adopted by OMCs were strategic differentiation, strategic mergers and strategic alliances. It was revealed that OMCs faced stiff competition in the Oil sectors that prompted their adoption of strategic responses to effectively cope in the environment. Some of the OMCs attained a high market share were Total Kenya, Vivo Energy and Kobil. The regression results found that the model was a good predictor. Strategic differentiation and strategic alliances were found to be statistically significant. Mergers and outsourcing were found to be statistically insignificant. It was concluded that there was a statistically significant relationship between strategic responses and performance of OMCs. The study recommends that OMCs should form more alliances in order to broaden and diversify their product lines, ERC should offer an enabling environment that allow OMCs to merge so as to benefit from synergy, ideas and investment in advanced technology. Product differentiation should be integrated with innovation to ensure that products and services target specific needs. It is further recommended that future research should consider other strategic responses not discussed in this study for example downsizing, divesture and product innovation to establish their contribution towards performance. This will enable the researcher to compare findings after which a plausible conclusion can be drawn.

Index Terms- Strategic Alliances, strategic mergers, strategic product differentiation, Performance

I. INTRODUCTION

1.1 Background of the Study

Strategic responses are perceived as key drivers in dealing with environmental challenges and responding to customer needs; Grant (2003) studied the benefits of strategic response in European of companies. The findings revealed that the adoption of strategic responses enabled oil firms to effectively respond to environmental dynamics. Further, it was revealed that oil firms that used strategic responses were able to maximize on their core competencies and thus provided value adding goods and services at a cheaper price than their competitors.

Pearce and Robinson (2005) argue that strategic responses are actions that are designed to enable the firm to cope with challenges in the environment. A survey by Collins (2014) in Netherlands found that most manufacturing firms that used strategic responses recorded better performance as compared to manufacturing firms that failed to implement strategic responses. Ketchen and Palmer, (2013) investigated the effectiveness of strategic responses and organizational performance in the Textile Industry. The study used a longitudinal research design. 300 managers were interviewed in different states. Textile firms that utilized strategic responses performed better as compared to those firms that were reluctant to adopt strategic responses.

Santhanam and Hartono (2003) examined the effectiveness of strategic responses on organizational performance of IT firms in US. The cross-sectional design was which consisted of a quarterly report. The study concluded that strategy did not necessarily enable firms to respond to their customer needs. A negative correlation between strategic responses and organizational performance was established. Jabar, Othman and Idris (2011) examined the relationship between organizations’ resource availability and absorptive capacity as well as type of alliances with organizational performance. The result establishes that Malaysian manufacturers need to increase their efforts in increasing internal resources that are the source of competitive advantage in order to achieve superior manufacturing performance.

Mohammed (2014) explored the link between strategic responses and performance of manufacturing firms in Dar es Salaam, Tanzania. The study applied a cross-sectional research design, 96 managers were interviewed and it was found that the most popular responses strategies adopted by firms were mergers, differentiation, product innovation and strategic alliances. Adoption of these responses was found to contribute positively towards improved performance.
Diallo (2012) explored the effectiveness of coping strategies by commercial banks to environmental dynamics in Senegal. The findings showed that the strategic responses utilized by banks were differentiation, mergers, strategic alliances and product innovation. Banks the employed these strategies were found to be efficient in their operations and thus, they were able to retain a large clientele. Kasekendi (2013) found that the adoption of strategic responses allowed manufacturing firms to adapt effectively to the changing environment. This made it easier for such firms to continuously record good sales and profitability. A strong correlation was found to be present between strategic responses and performance.

Imalingat (2015) did an investigation of strategic responses of mobile money transfer services in Barclay banks in Kampala, Uganda. The results found that product innovation, differentiation, strategic alliances and mergers were commonly used strategies by Barclays. Implementation of these strategies enabled the bank to effectively cope with changes in the market and guarantee survival. In so doing, the bank was able to cater for the growing needs of its customers. This improved customer loyalty, growth sales and increased profitability.

Akinyele and Fasogbon (2010) examined the impact of strategic responses on firm performance of service firms in Lagos, Nigeria. The study found that strategic alliance and product innovation influenced firm performance. Product innovation adoption led to increased sales since customers got quality products which were difficult to imitate by competitors. The findings depicted that strategic alliances improve synergy between firms. It also widened the scope of services and products offerings to the customers giving many customers a chance to access products.

In the Kenyan context strategic responses has attracted growing attention as a tool to enhance performance. Some studies have been done relation to strategic responses and performance. Murule (2011) studied the strategic responses used by pharmaceutical manufacturing firms in Kenya. The study used a cross-sectional design where data was collected using questionnaires once. Primary data was collected using semi-structured questionnaires. The results found that pricing, marketing and strategic alliances were the most commonly used strategies in pharmaceutical firms to maintain competitive advantage.

Kilonzi (2012) investigated the strategies responses used by NIC bank. A cases study was used to carry out an in-depth investigation of NIC bank. Five (5) departmental heads were interviewed and data was analyzed using content analysis. The findings revealed that differentiation and diversification were the main strategic responses used by NIC bank.

Kimumugyi (2013) studied strategic responses adopted by agrochemical firms. The study used a descriptive survey to find out the strategic responses adopted and their contribution to organizational performance. Primary data was collected using unstructured questionnaires that were administered using ‘a drop and pick’ later method. The findings indicated that the most popular responses adopted by agrochemical companies were differentiation and go-to-market strategy. Kamau (2014) assessed the influence of strategic responses on competitiveness of Faulu bank. The study used a cases study research design and primary data was collected using questionnaires. The findings revealed that strategic alliances and differentiation were popular strategic responses implemented by Faulu bank.

The Kenya oil market comprises of 64 companies that are involved in the distribution of petroleum products in Kenya as per 2013 data from the pipeline coordinator. A few Oil marketers have retail stations while others lack but are involved in the exportation of petroleum products and wholesale to other companies. Five dominants players in the Kenyan Oil market command a market share above 5 percent. These are Total, Kenol-Kobil, OMCs, Oil Libya and National Oil that consists of 72 percent combined proportion of the Retail stations at 45 percent.

This is an indication that major oil companies have a competitive edge over their rivals (EAOGS, 2014). Of the major oil marketers, Kenol-Kobil, and National Oil is local. As at end 2013, there were approximately 1400 Retail stations countrywide with more than five dominant players owning a combined total of 654 of the stations in the country (Total=188, Kenolkobil=166, OMCs=121, National Oil=101, oil Libya=78). The domestic sales of the industry in 2013 stood at 4550 kilometers cumbied, and the total industry sales in the Retail stations stood at 1795 km3. The growth rate annually is estimated at an average of 4 percent per annum (Deloitte Report, 2013).

The oil marketing firms share in joint imports for motor fuels to realize economies of scale. The ministry of energy coordinates the imports with the help of an open tender system. The Oil Marketing Company (OMC) that offers the most competitive quote imports on behalf of the industry, The OMCs have a joint facility at the port and Kenya Pipeline Company (KPC) to import and transport petroleum products. The OMCs have agreed to share services that are not sufficient to service the oil needs in Kenya. The oil companies have their storage depots in Mombasa and Nairobi that gives them a competitive edge over their rivals since they can hold buffer stocks to maintain their operations when Kenya Pipeline is out of stock (EAOGS, 2014).

The oil industry faces increasing competition due to the growing demand for oil and petroleum products in Kenya. Oil marketing firms supply oil in Kenya and in the region, they undergo through an open tender system whereby the oil firms with the most competitive quote imports on behalf of the oil industry. The ministry of energy is charged with the responsibility of coordinating the open tender system (Munyasya, 2014). To serve the current needs of the market oils firms should consider adopting strategic responses that will allow oil marketing firms to utilize their core competencies to provide value adding goods and services to customer. This will attract more customers and contribute to superior performance (Munyasya, 2014).

Firms operate in an environment that is complex and uncertain this necessitates the need to respond to environmental challenges so as to survive in the business environment. However, there are certain environmental aspects that the firm is sensitive and must therefore respond to survive. The environment comprises of opportunities, threats and constraints; rising prices, competition and technological changes are important topics that require organisations to find ways to manoeuvre in order to survive. Strategic responses have been described as effective in enabling a firm to cope with environmental alterations. These responses are changes which take place overtime to the strategies.
and goals of an organisation. Such change can be dramatic or gradual (Thompson, 2007).

Santhanam and Hartono (2003) contend that, strategic responses are changes which affect the strategic behaviour of an organisation. These responses might take several forms depending on the capability of the organisation and the nature of the environment in which they operate. Well-defined and aligned strategic responses form a formidable weapon for the organisation in obtaining and sustaining competitiveness. Strategic responses have been adopted and implemented by firms as a means to counter challenges in the environment. These responses have yielded desired outcomes in some firms while in other firms the responses have failed. Studies have been conducted to investigate the link between strategic responses and performance however, there lacks conclusive findings demonstrating this relationship. Ketchen and Palmer (2013) found an inverse association between strategic responses and performance. Murungi (2013) revealed that there was a positive relationship between strategic responses and performance. Mokua and Muturi (2015) concluded that strategic response impacted positively on productivity of Pharmaceutical Firms in Kisii County. Murungi (2013) found that most OMC’s utilized to a great extent strategic alliances (64%), focus market (50% percent), joint ventures (50%), as well as corporate diversification (34%) as strategies in responding to dynamic economic environment. It was concluded that strategic responses were less utilized but would be effective if they were adopted. Although strategic responses have been studied, limited focus was given on the link between strategic responses and performance of OMCs in Kenya which, this study found worthwhile to investigate.

The general objective of the study was to determine the influence of strategic responses on the performance of Oil Marketing Companies in Kenya. The specific objectives were: to establish the influence of strategic alliances on the performance at Oil Marketing Companies in Kenya, to assess the influence of strategic outsourcing on the performance at Oil Marketing Companies in Kenya, to examine the influence of strategic mergers on the performance at Oil Marketing Companies in Kenya and to assess the influence of strategic product differentiation on the performance at Oil Marketing Companies in Kenya.

II. LITERATURE REVIEW

2.1 Theoretical Framework

This section reviews a discussion of the theories that anchor this study which include; Resource-based View, the Relational View of Strategy, Theory of Efficiency and Dynamic Capability Theory. These theories which have been discussed as per the research objectives.

2.1.1 Resource-Based View

In line with the theory, product differentiation enables the firm to widen its customer segment and to fulfill unmet customer needs. Product differentiation allows the firm to exploit its core competencies by offering products and services that add value to customers (Barney, 2001). Resources are inputs into an organization’s production process, they include; capital, employees skills, finances, equipment, goodwill and gifted managers. Resources are either intangible or tangible in nature (Hoopes, Madsen, Walker, 2003).

To successfully implement product differentiation, the firm has to make maximum use of its available resources. Individual resources might not necessarily lead the firm to a competitive gain but through synergy and integration of competitive resources the firm can effectively meet diverse needs of the customers (David and Cynthia 1995). RBV has been researched extensively in establishing the relationship between the organization’s internal characteristics and performance. The basic idea is that the firm is a constituent of different resources put together and the manner in which an organization utilizes its available resources is critical in developing its competitive abilities and producing superior products and services (Hoopes, Madsen & Walker, 2003).

Kirchoff (2011) explains that organisational competitiveness is how best an organisation reacts to various environmental challenges. In this case, product differentiation is a way that the organisation utilizes reach out to customers whose needs were previously unmet. This can be realized through tailoring customers’ products and services to cater for the evolving wants of consumers. One of the ways used by firms to counter dynamics in the environment is the utilization of their core competencies and to develop efficient capabilities that can be valued by their customers. Improving value to customers is one of the main objectives why firms adopt strategic responses in an attempt to tailor their products and services to meet the needs of the consumers.

RBV integrates product differentiation and competitiveness. Managing a company’s strategic decisions and aligning these strategies to the firm’s vision and mission is critical in enhancing the effectiveness of product differentiation utilized by the firm this attracts many consumers while retaining existing ones. Product differentiation is a resource to the organisation, effective utilization of product differentiation increases the scope of customers leading to customer value and satisfaction. This attracts more customers leading to increased sales and firm performance (David & Cynthia, 1995).

2.1.2 The Relational View of Strategy

Dyer and Singh (1998) have offered a relational view of competitive advantage that focuses on network routines and processes as a vital unit of analysis for understanding competitive advantage. The relational view critiques the BRV’s assumption that resources are held by a single firm. It is argued that Dyer and Singh (1998) that the firm’s resources might go beyond organisational boundaries. Dyer and Singh (1998) explain that an inter-firm linkage is a source of relational rents and competitive advantage. The define a relational rent as, a supernormal profit jointly generated in an exchange association that cannot be generated by either firm in isolation and can only be created through joint idiosyncratic contributions of the specific alliance partners’ (Dyer & Singh 1998).

They identify 4 relational rents as a source of competitive advantages: relation-specific assets, knowledge-sharing routines, complementary resources and capabilities and effective governance. Dyer and Singh (1998) indicated that a fundamental level, relational rents are possible when alliance partners combine exchange or invest in idiosyncratic assets, knowledge, and resources and capabilities, they effective governance mechanism that lower transaction costs or permit the realization
of rents through the synergistic combination of assets, knowledge or capabilities.

The relation view of strategy is becoming increasingly popular (Wang 2004). A number of authors have discussed about inter-firm collaboration (Easton 1992; Easton & Araujo 1997; Ebers 1999; Oliver 1990), business interactions (Wang 2004), relationships (Perrow 1986; Walter et al. 2001) and networks (Alhuja 2000; Gargiulo & Gulati 1999; Gulati et al. 2000). An inter-organisational network involves relationships between two or more firms both in the micro-level and macro-level contexts (Ebers 1997). The micro-level context involves resources flows, information flows and flows of mutual expectations between firms. The macro-level context includes institutional, relational, PESTEL factors (political, economic, social, technological, ecological and legal) and regional contingencies (Ebers 1997). In line with the study, strategic alliances are adopted by firms in the same business after taking into account technical criterion. This makes it easier for firms to work together in an organized fashion while maintaining lower costs and efficiency. This conforms to Meyer and Rowan (1977) who argued that adoption of technical efficiency leads to reduced operational costs, improved quality and competitiveness.

2.1.3 Theory of Efficiency

Theory of efficiency explains that mergers will only occur when they are anticipated to generate synergy to enable the organization and mutual benefit for both firms. Through symmetric expectations of gains, organizations have realized the importance of merging and therefore express disinterest when they anticipate that gain in value from merging will not be positive. When a merger deal is proposed, Banerjee and Eckard (1998) and Klein (2001) highlight that a positive return is expected to both the acquirer and the target. Klein (2001) puts more emphasis on the need to distinguish operative synergies of ‘efficiency gains’ that are achieved through economies of scale and allocative synergies or conclusive synergies. Allocative synergies are as a result of a high market power and an increased ability to extract consumer surplus in matters pertaining creation of value when considering a merger. Extant literature depicts that use of synergies is one of the critical drivers used to achieve superior performances as a result of the gains that are associated to synergies such as capital base and diversity of products and service offering (Devos et al., 2008; Houston et al., 2001).

Mergers open up markets for enhanced allocative synergies which contribute to positive benefits. Mukherjee et al. (2004) posit that companies possessing a high market power charge extra premiums to earn greater margins through consumer surplus. Such firms’ records better performances than their rivals. On the same note; Kim and Singal (1993); Sapienza (2002) explain that companies that practice mergers record better performances. This is attributable to increased amount of sales which contribute to improved performance. Market power enables the organization to make high sales as a result of diverse market segments.

Cefis et al., (2008) argues that a high market power and allocative synergy gains create a major hindrance for other market players. Firms that dominate the market utilize their core competencies and their distinctive capabilities in providing value adding products and services that are difficult to duplicate by competitors. This discourages new entrants that are trying to gain a niche in the market thus allowing big organizations to continue dominating the market (Motta, 2004). Bensanko (2006) contends that mergers allow firms to offer products at an extra premium which increases the sales margins for the firms and thus improved performance.

Weston, Mitchell and Mulherin (2004) argue that mergers provide a platform for the organization to share knowledge and ideas for purposes of improving their procedures and processes to improve efficiency and mitigate the cost of operations. This significantly reduces the cost of operations and increases value for goods and services. This brings about customer a high level of customer satisfaction and hence increased sales. Weston et al. (2004) suggest when a performing organization acquires an underperforming firm; it might consider removing the underperforming managers and replacing them with competent managers who can harness their skills and competencies in devising strategies to make the organization more efficient and effective. This will lead to improved firm performance.

2.1.4 The Capability-Based View

Grant (1991) noted that capabilities are a source of competitive advantage and resources are a source of capabilities. Amit and Shoemaker (1993) indicate a similar position and explain that resources do not impact on sustained competitive gains of a firm, but its capabilities do. Haas and Hansen (2005), as well as Long and Vickers-Koch (1995), supported the importance of capabilities and suggest that a firm can gain competitive advantage from its ability to apply its capabilities to perform important activities within the firm. Amit and Shoemaker (1993), define capabilities in contrast to resources, as ‘a firm’s capability to deploy resources, in a blend of organisational processes that are information-based, tangible or intangible processes which are firm-specific and developed over time through complex interactions among the organisational resources.

Teece et al. (1997) define capabilities as, ‘the firm’s ability to align, build, and reconfigure internal and external competencies that can accommodate a dynamic environment. Grant (1996) defines organisational capability, as, the ability to perform a productive task that relates either directly or indirectly to the organisational capacity to create value through enhancing the quality of input to transform outputs. Grant (1996) groups capability into four categories. Cross-functional capabilities, broad-functional capabilities, activity-related capabilities and specialized capabilities; Sirmon et al. (2003) emphasized on the importance of organisational learning. They argue that capabilities and organisational learning implicitly and explicitly are part of strategy in the firm. Zack (1999) argued that the ability to learn and create new ideas is critical for gaining competitive advantage. Lee et al. (2001) described the influence of internal abilities and external networks on firm performance.

The concept of dynamic capacities is important because the environment where business operate are uncertain hence the need for organisations to cope to environmental changes. Firms use different approaches to build dynamic capacities depending on the prevailing environment conditions and the objective of the firm. A firm can decide to strategically outsource some of its functions if it is cheaper and more efficient. This way, the firm can easily concentrate on its core activities and work towards it.
vision and mission. In so doing, the firm can easily be able to adjust to the environment and compete effectively with its competitors.

In support of this, Wade and Hulland (2004) observe that when the firm is seeking to implement a strategic plan, it has to consider whether to outsource some of its functions. The decision to outsource services highly depends on how well the firm is aligned to its resources and capacity to strategically outsource services from a credible organisation.

2.2 Empirical Review

2.2.1 Strategic Alliances

Ferdinand (2012) investigated the impact of strategic alliances on performance of Tesco Company in the UK. The researcher carried out a survey of 230 employees in several company departments with the help of an explanatory research design, the results found that through the adoption of strategic alliances firms enhanced performance. A significant link was found present between strategic alliances and performance. Adoption of strategic alliances contributed to reduction of costs and value addition.

Camison et al. (2011) studied the effect of participating in technological strategic alliances on business performance through taking into consideration the knowledge-based unique competencies as a mediating variable using sampled Spanish firms. The findings showed that the link between research and development (R&D), innovation strategic alliances, and performance is mediated by knowledge-based generation of distinctive competencies and that the contribution of participating in alliances to a firm’s growth depends on its creation of innovative competencies. This implies that research and development managers must enhance the development of this kind of competencies to realize superior performance.

Matata and Oduor (2014) studied the effects of strategic alliances on performance of supermarkets and their alliances in Kenya. The study applied a correlational research design. The sample involved five big supermarkets (Nakumatt, Ukwala, Naivas, Tuskys and Uchumi) and 95 of their strategic alliances. Data was collated from head offices of these firms with the help of the questionnaires. Analysis of data was done using a multiple regression model to test the effect of the independent variables that relate to strategic alliances and the performance. Analysis of variance and t-test (one tail) were applied to determine the level of significance. Empirical results showed the existence of an inverse linkage correlation between technological strategic alliances and performance. There was no statistical significant nexus between technological alliances and performance among supermarkets and their strategic alliances in Nairobi CBD.

Correlation findings showed the existence of a weak, negative effect between production strategic alliances and supermarkets performance. There existed a strong and positive impact between marketing strategic alliances and performance. About supermarkets alliances, a medium and positive correlation between marketing strategic alliances and performance was found. However, 2 tailed tests showed a statistically insignificant link between the variables. Multiple regression results found that strategic alliances were weakly related to performance. Analysis of variance showed that the link between strategic alliances and performance was statistically insignificant for the supermarket alliances but significant for the supermarkets. Under t-test analysis, strategic alliances and performance was found to be statistically significant.

2.2.2 Strategic Outsourcing

Yankelovich (2013) investigated two-thirds of firms worldwide outsource at least a single business process to a third party. This practice is popular in the U.S., Canada, and Australia, where 72 percent of business processes are outsourced. Javaligi (2008) indicated that successful implementation of outsourcing strategies results into reduction in costs, increased capacity and quality. Kotabe (2009) noted the possibility of having long-term negative impacts of outsourcing as a result of a firm’s dependence on autonomous suppliers. This form of reliance on outsourcing might inhibit the company to sustain long-term competitive gains without participating in the development activities regularly. This observation collaborates with Corley (2011) when he assessed the results of technology outsourcing partnerships from outsourcing organisation’s point of view and found that, equity-related alliances were more effective than contract-related outsourcing.

Steenma, Kevin and Corley (2010) made suggestions that the results from technology partnerships for outsourcing organisations depends on the nexus between technology attributes and interdependence between the source and outsourcing firms. Klaas et al (2001) found that the influence of organisational traits was highly contingent, indicating that the organisational traits had a different impact on the various types of outsourcing activities outsourced. As such, it can be concluded that many factors such as pay level, promotional opportunities and demand uncertainty must be considered when making a decision on whether to source functions of activities.

Akwewushola and Elegbede (2011) assessed the axiomatic relationship between outsourcing strategic performance of Nigerian manufacturing sector. The study adopted a stratified sampling approach to achieve at 120 sample elements. Some top and middle level managers of Cadbury Nigeria Plc and Nestle Foods Plc were interviewed. The results revealed that outsourcing firms experienced reduced average cost, increases in sales turnover and profitability. In addition, there was improved; expertise, service quality and streamlined production processes. Lau and Hurley (2011) did an examination of the link between outsourcing and profitability margin; it was revealed that Chrysler’s profit margin was four times higher as compared to that of the GM due to the effectiveness of outsourcing strategy. Frayer, Scannell, and Thomas (2011) contend that firms perceive outsourcing strategy as a way of minimizing costs, improving quality and increasing an organisation’s overall competitive position. In accordance to Ellram, Tate and Billington (2007), outsourcing has an impact on the day-to-day management and performance, as well as strategic implications. Hence, firms must outsource wisely. Outsourcing decisions might affect the firm’s cost structures, long-term competitiveness and alter the nature of risks that the firm should manage.

2.2.3 Strategic Mergers

Athanasoglou and Brissimis (2014) utilized operating performance methodology on revenue, cost, profit and productivity ratios during pre-merger and acquisition period 2004-2007 and post-merger and acquisition period (2000-2002). It was found that mergers positively influenced profitability of merged banks; it also led to improved cost efficiency. Also,
Athanasoglou and Brissimis (2011) applied an event study methodology for merger and acquisitions in Greek banking sector in the period 2008-2009, an examination of 7 different cases was carried out. The results showed that banks attained a higher cumulative abnormal return as compared to bidder banks.

Siems (2011) applied event methodology in the case of 24 US bank mega-mergers (deals exceeding $500m) in 2005. It was found that the shares of the target bank increased by 13.04% but those of the acquirer declined by 1.96%. The results were found to be significant at 1% level. Several studies use accounting data. Vander Vennet (1996) examined European bank mergers between 1998-2003; the two studies applied accounting data and the efficient approach. The accounting data comprised of several financial measures such as return on assets, return on equity and asset utilization. It was concluded that domestic mergers between equal-sized partners led to a significant increase in the level of efficiency among merged banks. Cornett and Teahanian (2008) did an examination of post-acquisition of larger bank mergers in the period 1992-1997. The report showed that merged banks outperform other banks in the banking sector.

Rezitis (2008), adopted a stochastic output function, it was found that mergers and acquisitions led to improved technical efficiency and improved productivity which resulted into growth of Greek banks. Noulas (2007), examined the growth productivity of Greek banking sectors in 1991 and 1992, with the help of Malmquist productivity index and the Data Envelopment Analysis method (DEA), a huge difference in growth of state and private banks was recorded. Most private banks embraced adoption of mergers and acquisitions as strategies to boost growth.

2.2.4 Strategic Differentiation

Hall and Saisa (2009) explored the link between differentiation and performance of American firms. The study adopted a sample of 64 firms in five different states. An exploratory research design was utilized and the results showed the existence of a significant relationship between differentiation and performance. It was established that firms that adopted differentiation as a strategy were able to attract more customers. A strong and positive correlation was found between differentiation and performance. Firms that utilized differentiation as a strategy recorded high levels of sales turnover which contributed to profitability. Alamdari and Fagan (2005) did an investigation of a model-based study through discussing the effectiveness of the low-cost model and its influence on bank profitability. The results showed that banks that attained the lowest costs and earned the highest amount of profits in cases when competing products were undifferentiated, selling at standard market price. Firms that adopted this strategy laid more emphasis on reduction of costs in each activity within the value chain.

Chan and Jamison (2009) assessed the effectiveness of differentiation on performance of Chinese firms in the period between 2001 and 2008. The study adopted a longitudinal research design which was carried repetitively in various phases. The findings showed that the sector witnessed key players moving in and out, several legal regulations were applied; the structure and the intensity of competition changed and differentiation became a key feature of competition. It was further revealed that a positive nexus was established between differentiation and performance.

Bonaccorsi di Patti and Gobbi (2011) tested the impact of differentiation on performance of Italian banks. A sample of 15 banks was used in Rome. Primary sources of data were used. The findings showed the adoption of differentiation improved value for products and services offered by the bank. This gave customers increased access to banking services and products. A positive correlation was found to exist between differentiation and performance. Many banks implemented differentiation as a strategy since they wanted to segment their niche markets by enhancing accessibility of banking services.

2.3 Critique of Existing Literature

From the reviewed literature it is evident that firms need to adjust themselves to the changing environment for survival. This way, they can compete effectively with their rivals by providing quality products at competitive prices. This attracts many customers since they can get value for products and services offered by a firm leading to satisfaction. Responding to environmental changes is important for the firm’s survival and strategic goals. Some firms respond but unfortunately, they do not survive in the environment. Ketchen and Palmer, (2013) strategic responses allow the firm to counter challenges such as competition, technology and other uncertainties that are beyond the control of the organization. Strickland, Gamble and Jain (2008) explain that the adoption of strategic responses enables the organization to marshal and allocate its resources in a unique and viable posture in accordance to its relative internal competencies and shortcomings, anticipated environmental changes and contingent moves by intelligent opponents (Pearce & Robinson, 2005). Successful implementation of strategic responses depends on how well the firm formulates and sets out its strategic plan.

Barney and Hesterly, (2008) maintain that a responsive and adaptable organization can continuously provide for the growing needs of its customers. Successful adoption and implementation of strategic responses require the firm to integrate its strategic responses with its corporate goals and objectives. Not all firms that adopt strategic responses succeed some fail. Yabs (2010) observed that most firms formulate strategic plans but few succeed in the implementation of these plans. White (2006) notes that to succeed in the implementation of strategic plans calls for effective coordination of the top management and the employees in achieving the same goals.

Top management team should set their targets and align the employees to work towards implementation of strategic plans. An organisation that endeavors to differentiate itself positively from its competitors, using its relative corporate strengths and weaknesses must ensure that customers get value for products and services offered. This will boost customer satisfaction and attract more customers. Some firms that have adopted strategic responses have failed while others have succeeded. It could be argued that the adoption of strategic response is not a guarantee towards the realization of corporate goals. The manner in which the firm implements its strategic plan and how well the plan is aligned to strategic goals highly determines the success of strategic responses. Firms that have succeeded in strategic response adoption have a strategic plan.
that acts as a road map on how the process of implementation will take place. Top management plays a crucial role in providing direction and aligning strategic goals with the mission and vision of the organisation. Firms fail to succeed in implementing strategic responses because of several reasons. These include poor leadership, inadequate resources, resistance to change among other factors.

Several studies depict a mixture of reaction on the link between strategic responses and performance. Munyasya (2014) found that the adoption of strategic responses contributed positively towards improved performance. He argued that implementation of strategic responses enabled firms to boost their efficiency and mitigate costs. These arguments are in harmony with Kamanja (2015) who concluded that the adoption of strategic responses improved the firm effectiveness. Further, Mokua and Muturi (2015) found a positive correlation between strategic responses and performance of Pharmaceutical firms. On the other-hand, some studies show the existence of either an inverse relationship or no relationship on the link between strategic responses and performance. Bidley (2011) observed the existence of an inverse relationship between strategic responses and performance. He noted that adoption of strategic responses was not sustainable due to competition from other players. Odhiambo (2014) found that use of strategic responses by firms did not necessarily lower costs. From these studies, it is evident that strategic response is a way in which firms opt to respond to environmental challenges.

Nevertheless, the approach applied by the firm is influential of the success or failure of a strategic response. It is worth noting that there are other strategies that an organisation can apply to respond to challenges in the environment apart from the one discussed above. Example includes allocating huge funds to research and development and modern technology. This approach enables the firm to easily understand its customers. Thus, the firm can tailor its services and products to suit customer wants. This improves satisfaction while it might attract new customers. Through investing in modern technologies, a firm can produce superior goods and services that are difficult to imitate by rivals.

2.4 Research Gaps

Strategic responses have been implemented widely in the developed countries such as U.S, U.K, and Asia as compared to the developing countries. Although developing nations are still reluctant to adopt strategic responses as a way of dealing with environmental challenges, few local researches that have investigated this area have found contradicting results.

Some show a positive linkage between strategic response and performance, other show a negative link between the two variables while others show no relationship. Still, strategic responses are instrumental in assisting firms to realize set strategic goals through survival and keeping up with the pace of a dynamic environment. Although differentiation of products and services enable the firm to meet its customer needs and widen the scope of the market, some firms that adopt differentiation have failed in widening the scope of their market segments.

Through strategic responses firms can merge, form alliances to create synergy by increasing resources and diversifying their product lines. This is not always the case, since a firm that was previous performing well can acquire a smaller firm that performs poorly and affect its performance negatively. Organizations can also outsource some of its functions to a third party who is a specialist in that area (Grant, 2005). This will assist the firm to access quality services at a cheaper cost and to focus its core functions. Hence, such a firm is able to deliver quality products and services at a cheaper price. On the contrary, a firm may outsource services, incur high costs and get poor quality services. This might attract losses to the firm and affect its performance (Munyasya, 2014).

III. RESEARCH METHODOLOGY

According to Sekaran, (2006), a research design is an overall strategy chosen by a researcher to combine various components of a study in a consistent and logical manner through ensuring that the research questions are addressed. It is a blueprint that guides the process of data collection and analysis. This study adopted a descriptive research design. This kind of design was useful in establishing the nature of existing situation and current conditions and also in analysing such situations and conditions.

A population comprises of a collection of objects those posses’ similar traits that can be used to make inference (Kothari, 2011). A population is classified into two; the study population and the target population. A small population is drawn from the target population. The study population is a smaller population studied in the research (Cooper and Schindler, 2008). The target population for this study included 36 OMCs in Kenya. The decision to choose OMCs was driven by the nature of their operations and the uniqueness of their products and services.

Sampling frame is defined as a list of objects in which a sample is drawn. It consists of all the elements in a study population (Cooper and Schindler, 2008). The sampling frame was 216 employees who worked in operations, marketing and finance departments (ERC, 2015). This category of employees was perceived to be involved highly in matters of strategy implementation and decision particular on strategy and organisational performance.

A sample is a small portion of a target population. Sampling means selecting a given number of subjects from a defined population as a representative of that population. A stratified sampling technique was used to select the respondents from different departments to get a representative sample. According to Kothari (2005) defines stratification as the process of dividing members of the population into homogeneous subgroups before sampling. The stratum was found to be mutually exclusive since every element of the population was assigned to a single stratum. A mathematical formula will be used to determine the sample size. The formula was advanced by Cochran (1975) as follows:

\[ n_0 = Z^2 \frac{pq}{e^2} \]

\( n_0 \) = the sample size

\( Z \) = is the area of the normal curve which cuts off an area \( \alpha \) at the tails. Where \( \alpha \) is the level of significance and 1-\( \alpha \) is the confidence level of 95% \( Z \) was arrived at as follows: 0.5-0.025=0.475 is the area that gives the Z value/Z-score in the normal distribution tables.

This value is ±1.96
P= is the estimated level of variability in the population and 
q=1-p. 
e= is the level of significance  
N= target population  
p=0.2, this percentage was adopted based on the recommendations made by Cochran (1975), the less variable (more homogeneous) a population is, the smaller the expected sample size. A proportion of 20% shows less variability in the population.  
q=0.8  
n= is a more reduced sample size  
=1.96²(0.2)(0.8)/(0.05)²  
n₀= 245.86  
To get a more reduced sample size, this formula is adopted;  
n= n₀/1+(n₀-1)/N 
=245.86/1+(245.86-1)/216 
=115 employees  

Questionnaires were utilized for data collection purposes. These questionnaires comprised of both structure and unstructured questions. Structured questions were useful since they are easy to use and comprehend. Unstructured questions were used to collect first-hand information on the thoughts and opinion of the respondents. This was achieved through interviews. The advantage of using questionnaires was because it was easier and faster to collect information as compared to interviews.  
The book for appointments with the operations and finance managers and explain to them the objective for this study. After getting the consent from the respondents, the researcher together with assistants used a ‘drop and pick’ later method at a time when the two parties agreed. The questionnaires were picked in duration of two weeks to give the respondents an ample time to go through all the questions and seek assistance from research assistants on the questions which they did not understand. This aided in enhancing the response rate and ensuring that the information gathered was accurate and reliable.  
The piloting exercise involved ten respondents who were picked randomly from ten OMCs. The main reason of conducting the pilot study was to predict the warnings and risks about the research project especially when the proposed approaches or instruments were inappropriate or too complex. The findings of this study were validated in consultation with the supervision by randomly choosing the target population and conducting a pilot study. The respondents in the pilot study were not included in the actual study.  
Cooper and Schindler (2008) validity is the degree to which the instrument measures the constructs under investigation. There are three types of validity tests; content, criterion and related construct validity. This study used content validity because it measured the degree to which the sample of the items represented the content that the test was designed to measure. At the same time, the validity of the instruments was subjected to scrutiny of the research supervisor.  
Kothari (2011) defines instrument reliability as the ability to measure an instrument and produce consistent results. It is the measure to which reliability as a measure of research instrument yields constant results after repeated trials. The researcher selected a pilot group to a few individuals from the target population to test the reliability of the research instruments. The study used Test-retest method to establish the reliability which assessed the degree to which test scores were consistent from one test administration to the next.  

Measurements were gathered from a single rater who used similar methods or instruments and similar testing conditions. If the correlation between separate administrations of the test was 0.7 or higher, then it was presumed to have good test-retest reliability.  

Data analysis was done using Statistical Package for Social Sciences. Quantitative data was analyzed using descriptive statistics and qualitative data was analyzed using content analysis. Descriptive statistics consisted of mean and standard deviation. Quantitative data was analyzed using descriptive statistics such as mean, standard deviation and measures of central tendency which were presented in form of tables. Frankfort-Nachmias and Nachmias (2008) posit that descriptive statistics allow meaningful description of scores and measurement using indices and statistics. A regression model was adopted to establish the relationship between strategic responses and performance. Performance was regressed against four variables: strategic alliances, strategic outsourcing mergers and differentiation.  

\[ Y = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + \varepsilon \]  
Where;  
\( Y = \) Organizational Performance (dependent variable)  
bₜ = constant  
b₁……b₅ = coefficients  
X₁ = Strategic Alliances  
X₂ = Strategic Outsourcing  
X₃ = Strategic Mergers  
X₄ = Differentiation Strategy  
\( \varepsilon = \) error term  

Presentation of data was done inform of quantitative and qualitative reports which will be presented inform of tables and essay form. For the quantitative reports, the tables consisted of mean and standard deviation values that were used to make interpretation of the analysis. Percentage, mean and standard deviation were used to show the frequency of responses. Tables were used to display the rate of responses and to facilitate comparison. Qualitative reports were presented in form of essay which were discussed as per the study objectives aligned with the theories and empirical studies.  

IV. RESEARCH FINDINGS, CONCLUSIONS, RECOMMENDATIONS AND AREAS FOR FURTHER RESEARCH  

4.1 Summary of Major Findings  
This section consists of the major findings for this study. These findings have been aligned to the study objectives as provided below:  

4.1.1 Strategic Alliance  
OMCs shared resources by working together with their counterparts. To achieve this, OMCs formed strategic alliances to expand their product lines and distribution channels and effectively diversify their product lines. Through formation of
strategic alliances OMCs achieved their set goals and targets. Each OMC was able to identify its roles since they were clearly defined; this was one of the main reasons why these firms came together. Shareholders and partners came together and shared common goals and vision.

4.1.2 Strategic Outsourcing
OMCs actively outsourced service providers to perform specialized roles and consequently got professional services from experts. This enabled OMCs to focus on their core activities and maximize on their competencies. OMCs negotiated for better deals and quality services from their vendors and this ensured on-time delivery of products and quality services and this resulted to improved value and customer satisfaction. While OMCs outsourced some services, it was revealed that that did not warrant them quality services since in some instances the cost of outsourcing was higher compared to the value that was realized.

4.1.3 Strategic Mergers
OMCs merged with their counterparts to form one company through integrating their businesses processes and procedures. OMCs enhanced work-force diversity by bringing employees from different cultural backgrounds together, to combine their skills, ideas and develop creativity to boost productivity. OMCs were able to grow and expand their businesses and product lines by broadening their market segments and targeting more customers. Through merging, OMCs pooled resources together making it easier for them to invest in modern technologies such as information communication technology for improved efficiency and reduced operational costs. Also, the firms penetrated into new markets and product categories.

4.1.4 Strategic Differentiation
OMCs implemented differentiation as a strategy to remain competitive in the market. They provided products and services with distinctive attributes to serve and target diverse customer needs, in different classes and segments for improved value and customer satisfaction. OMCs designed and packaged their products to suite different customer needs. Most of the products purchased from OMCs were not standard hence it was easy to find alternative suppliers implying that suppliers had adequate capacity and capabilities to offer unique products. The oil market was sensitive and knowledgeable about the market trends and pricing and this forced OMCs to respond to such needs efficiently through partnering with strategic suppliers. Effective product differentiation improved OMCs reputation by practicing continuous innovation that ensured that any unmet customer needs were addressed consistently. Product differentiation by OMCs impacted on marketing and distribution channels through targeting new markets, introducing new products or addressing unique needs. The firms also built good relationships with the suppliers making it easy for OMCs to distribute their products.

4.2 Conclusion
There are a number of conclusions that can be made in relation to the influence of strategic responses on performance of OMCs in Kenya. To begin with it came out clearly that the most popular strategic responses adopted by OMCs were strategic differentiation, strategic mergers and strategic alliances. The study went on to demonstrate that OMCs adopted these strategies to counter stiff competition in the oil sector and to remain competitive in the market. This is attributable to the fact that some OMCs have a higher commanding market share than others making the competition to be stiffer. Some of the OMCs particularly those that commanded a higher market share such as Total, Vivo Energy and Kobil did outsourcing of their core activities to minimize their operational costs and improve the quality of their services. As such, this impacted greatly on their performance. This is clearly depicted by the relationship between strategic responses and performance of OMCs in the regression model adopted by this study.

4.3 Recommendations
OMCs should form more alliances to expand and diversify their product lines. This will enable them to minimize risk, attract more customers, work closely with their alliance partners, share resources and work towards achieving corporate goals. Moreover, OMCs will be able to define their roles and set their strategic direction which is critical for planning.

The study recommends that OMCs should only outsource those services in which they lack expertise and specialized skills and are critical to the company operations. This will help OMCs to save on huge costs from outsourcing services which do not impact on the business and overall performance of the firm. Out sourcing should be aimed at relieving the firm from the burden of not concentrating on its core activities.

ERC should provide a conducive environment for OMCs to easily merge and widen the scope of their operations. In so doing, OMCs will invest in modern technology and research and development resulting into improved quality of products and services. This will also promote free and fair competition since smaller OMCs can merge with large OMCs and compete alongside their rivals competitively.

The study further recommends OMCs should align their strategic differentiation with innovation in order to come up with products that aim to satisfy specific needs. To accomplish this, oil marketers should involve all their stakeholders in strategic differentiation plans and decisions to ensure that all unmet customer needs have been addressed. This will lead to increased sales and profitability and eventually improve performance.

The study recommends that further studies should be undertaken to incorporate other strategic responses such as product innovation, downsizing and divesting in order to find out their impact on performance of OMCs. This will provide a basis of comparison to find out the strategic responses that impact greatly on performance after which a conclusion can be drawn on the basis of the basis of solid facts.

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### Table 4.1: Return Rate

<table>
<thead>
<tr>
<th>Target Respondents</th>
<th>Actual Respondents</th>
<th>Response rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>115</td>
<td>105</td>
<td>91%</td>
</tr>
</tbody>
</table>

### Table 4.2: Age brackets of the Respondents

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Below 25 years</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>30-35 years</td>
<td>26</td>
<td>25</td>
</tr>
<tr>
<td>36-45 years</td>
<td>40</td>
<td>38</td>
</tr>
<tr>
<td>46-55 years</td>
<td>32</td>
<td>31</td>
</tr>
<tr>
<td>55 years and above</td>
<td>7</td>
<td>06</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>105</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

### Table 4.3: Position of the Respondents

<table>
<thead>
<tr>
<th>Position</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations Manager</td>
<td>52</td>
<td>50</td>
</tr>
<tr>
<td>Marketing Manager</td>
<td>29</td>
<td>27</td>
</tr>
<tr>
<td>Finance Manager</td>
<td>24</td>
<td>23</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>105</strong></td>
<td><strong>100.0</strong></td>
</tr>
</tbody>
</table>

### Table 4.4: Length of Service in the Organisation

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 5 years</td>
<td>29</td>
</tr>
<tr>
<td>5-20 years</td>
<td>62</td>
</tr>
<tr>
<td>20 years and Above</td>
<td>09</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
### Table 4.5: Strategic Alliances

<table>
<thead>
<tr>
<th>Strategic Alliances</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>The company has agreed formally to share resources by working together with other oil firms</td>
<td>105</td>
<td>3.881</td>
<td>0.792</td>
</tr>
<tr>
<td>The company has a wide distribution channel and many product lines</td>
<td>105</td>
<td>3.561</td>
<td>0.997</td>
</tr>
<tr>
<td>The strategic alliances adopted contributes to the mission and vision of the firm</td>
<td>105</td>
<td>3.911</td>
<td>0.873</td>
</tr>
<tr>
<td>The role of each firm is clearly identified</td>
<td>105</td>
<td>3.920</td>
<td>0.717</td>
</tr>
<tr>
<td>The stakeholders (investing companies) shared in the same goals</td>
<td>105</td>
<td>3.654</td>
<td>0.844</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>105</td>
<td>3.7854</td>
<td>0.8446</td>
</tr>
</tbody>
</table>

### Table 4.6: Outsourcing

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>84</td>
</tr>
<tr>
<td>No</td>
<td>21</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>105</td>
</tr>
</tbody>
</table>

### Table 4.7: Effect of Strategic Outsourcing

<table>
<thead>
<tr>
<th>Strategic Outsourcing</th>
<th>N</th>
<th>Mean</th>
<th>Std Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>The firm engages a service provider to perform certain role</td>
<td>105</td>
<td>4.122</td>
<td>0.794</td>
</tr>
<tr>
<td>The firm gains access to professionals and expertise</td>
<td>105</td>
<td>4.001</td>
<td>0.877</td>
</tr>
<tr>
<td>The firm negotiates the contract agreement with the vendor</td>
<td>105</td>
<td>3.364</td>
<td>0.687</td>
</tr>
<tr>
<td>The firm has full concentration on its core activities</td>
<td>105</td>
<td>3.421</td>
<td>0.552</td>
</tr>
<tr>
<td>The firm has access to more specialized services</td>
<td>105</td>
<td>2.393</td>
<td>0.591</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>105</td>
<td>3.928</td>
<td>0.840</td>
</tr>
</tbody>
</table>
### Table 4.8: Mergers

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>58</td>
</tr>
<tr>
<td>No</td>
<td>47</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>105</strong></td>
</tr>
</tbody>
</table>

### Table 4.9: Effect of Strategic Mergers

<table>
<thead>
<tr>
<th>Strategic Mergers</th>
<th>N</th>
<th>Mean</th>
<th>Std Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>The firm has combined with other firms into a single corporate entity with a new name</td>
<td>105</td>
<td>2.451</td>
<td>0.894</td>
</tr>
<tr>
<td>The firms has expanded its business and product lines</td>
<td>105</td>
<td>3.951</td>
<td>0.677</td>
</tr>
<tr>
<td>The firm has ventured into new markets</td>
<td>105</td>
<td>3.654</td>
<td>0.537</td>
</tr>
<tr>
<td>The firm has improved workforce diversity</td>
<td>105</td>
<td>3.104</td>
<td>0.652</td>
</tr>
<tr>
<td>The firm has improved access to modern technology</td>
<td>105</td>
<td>3.811</td>
<td>0.791</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>105</td>
<td>3.942</td>
<td>0.710</td>
</tr>
</tbody>
</table>

### Table 4.10: Effect of Strategic Differentiation

<table>
<thead>
<tr>
<th>N</th>
<th>Mean</th>
<th>Std Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>The firm targets all classes of customers</td>
<td>105</td>
<td>3.943</td>
</tr>
<tr>
<td>The firm offers products and services with specific attributes to meet customer expectations</td>
<td>105</td>
<td>3.951</td>
</tr>
<tr>
<td>The firm offers value adding products and services</td>
<td>105</td>
<td>3.792</td>
</tr>
<tr>
<td>The firm has a great reputation for innovative products and services</td>
<td>105</td>
<td>3.290</td>
</tr>
<tr>
<td>The firm has perfected its marketing and distribution systems</td>
<td>105</td>
<td>2.465</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>105</td>
<td>3.4882</td>
</tr>
</tbody>
</table>
Table 4.11: Performance Levels of OMCs

<table>
<thead>
<tr>
<th>N</th>
<th>Mean</th>
<th>Std Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>The firm has increased its sales turnover</td>
<td>105</td>
<td>3.711</td>
</tr>
<tr>
<td>The firm has improved its level of customer satisfaction</td>
<td>105</td>
<td>3.394</td>
</tr>
<tr>
<td>The firm has improved its level of efficiency</td>
<td>105</td>
<td>3.781</td>
</tr>
<tr>
<td>The firm has minimized its operational costs</td>
<td>105</td>
<td>3.601</td>
</tr>
<tr>
<td>The firm has improved its return on investment</td>
<td>105</td>
<td>3.815</td>
</tr>
<tr>
<td>The firm has improved its level of profitability</td>
<td>105</td>
<td>3.910</td>
</tr>
<tr>
<td>The firm has improved its corporate image and reputation</td>
<td>105</td>
<td>2.910</td>
</tr>
<tr>
<td></td>
<td>105</td>
<td>3.589</td>
</tr>
</tbody>
</table>

4.10.2 Model Summary

Table 4.12: Regression Analysis

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.854(a)</td>
<td>.729</td>
<td>.701</td>
<td>.03311</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), alliances, outsourcing, mergers, differentiation

Table 4.13: Analysis of Variance

| ANOVA\(a\) |
|---|---|---|---|---|---|
| Model | Sum of Squares | df | Mean Square | F | Sig. |
| 1 | Regression | .110 | 4 | .0275 | 91.667 | .000\(b\) |
| Residual | .037 | 100 | .0003 |
| Total | .147 | 104 |

a. Dependent Variable:

b. Predictors: (Constant), alliances, outsourcing, mergers, differentiation

The regression mode adopted for this study was found to be significant since the probability value was less than 5%, 0.000.
Table 4.14: Regression Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td>.030</td>
<td>.022</td>
<td>1.337</td>
<td>.061</td>
</tr>
<tr>
<td>Alliances=X</td>
<td>.022</td>
<td>.005</td>
<td>.186</td>
<td>2.041</td>
</tr>
<tr>
<td>Outsourcing=X</td>
<td>-.011</td>
<td>.005</td>
<td>-.017</td>
<td>-.193</td>
</tr>
<tr>
<td>Mergers=X</td>
<td>.000</td>
<td>.004</td>
<td>-.001</td>
<td>-.031</td>
</tr>
<tr>
<td>Differentiation=X</td>
<td>-.070</td>
<td>.008</td>
<td>-.821</td>
<td>-8.956</td>
</tr>
</tbody>
</table>

a. Dependent Variable: performance

Since some variables lack significant t-test values Pearson Correlation is deemed to be redundant hence this test was not carried out.
Factors Influencing Adoption of Mobile Technologies in Public Service Delivery: A Survey of Kajiado North Sub-County

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²College of Human Resource Development, Jomo Kenyatta University of Agriculture and Technology, Kenya

Abstract- This study examined the factors contributing to adoption of mobile technologies in public service delivery in Kajiado North sub-county. The independent variables were performance expectation, effort expectancy, social influence and facilitating conditions in line the Unified Theory of Acceptance and use of technology. Simple random sampling based on sample frame of all heads and deputy heads of government departments based in the sub-county was used. The main instrument for the study were self-constructed questionnaire. Data was organized, edited, analyzed and interpreted using descriptive and inferential statistics with the help of Statistical Package for Social Science (SPSS) version 2.0. The data was categorized, themes established, coded, entered into the computer and analyzed. The results were presented in graphs, tables and charts to present frequencies and percentages. The study findings showed that the four independent variables that were studied, explained only 60.1% of the adoption of mobile technologies as shown by the R2 thus the other variables that were not covered in this study scope accounts for 39.9% of the variation in adoption of mobile technologies. The study findings also showed that the all the variables had a positively significant impact on the adoption of mobile technologies in Kajiado North Sub-County. The study recommended that the county government should empower their employees through trainings on how to use mobile technologies in delivering services to the public. The study also recommended that further studies should be conducted to establish other challenges (38.9%) influencing the adoption of mobile technologies in public service delivery especially in other counties.

Index Terms- performance expectation, effort expectancy, social influence, Public Service Delivery

I. INTRODUCTION

Information technology in today’s office place has expanded dramatically. Some estimates indicate that since the 1980’s about 50% of all new capital investments in organisations have been in information technology (Venkatesh, Morris, Davis, & Davis, 2003). With growing computerization and increasing internet connectivity, the world has presently reached a stage where more and more users are motivated to modifying their ways of doing things in order to leverage the advantages provided by information communications technologies. In the case of citizens, it holds the promise of enhanced access to information and government agencies, improved service delivery and transparency in dealings and interactions with government (Danida, 2012).

According to Mofleh (2008), it has been well established in theory and practice that an effective and efficient government contributes to good governance and, by extension, development. Efficiency, effectiveness and public service delivery in government mean that processes, people, structures, institutions and actors produce results that meet specific targets while making the best use of existing resources. Today, these targets include, among other things, the adoption of an enterprise approach, scaling operations, establishing monitoring and performance evaluation systems, engaging citizens, providing timely results, research and development, competition, change management systems, divestment, sharing services across agencies and organizations, reducing costs, clear reporting systems, establishing smaller teams, improving the quality of public service and less bureaucracy (Grindle, 2007).

Recent discussions on government efficiency, effectiveness and public service delivery recognize the advantages of using ICTs in public entities (Kumar & Best, 2006). This is referred to as electronic government or e-Government. Today, many nations round the world are working to increase openness and transparency. Information technology is widely viewed as a cost-effective and convinient way to achieve efficient service delivery and reduce corruption (Kumar & Best, 2006).

Kenya has not been spared this agony, and many policy documents have been developed to find ways to address the problems of low levels of service delivery to the majority of citizens. According to Kumar and Best (2006), electronic government is an idea first raised by former U.S. vice president-Al Gore, within his vision of linking the citizen to the various agencies of government for getting all kinds of government services in an automated and automatic way, in addition to the completion of the government working itself depending on information and communication networks to reduce costs, improve performance, speed of delivery and effectiveness of implementation.

The researchers analyze the factors influencing adoption of mobile technologies in public service delivery with special emphasis on Kajiado North sub-county. With the recent devolution in Kenya which has also been termed as the most ambitious form of devolution in the world in the words of President Barrack Obama, the overall state of governance will be determined by the efforts put
in place by individual counties. The research will study factors influencing adoption of mobile based IT among individual government officials working in Kajiado sub-county. It will be worthwhile to note that different individuals react differently to information technology. The success of information technology as a driver of efficiency in public service delivery will depend on how well the officials embrace it.

Wamoto (2015) posited that there is significant pressure from citizens in the Kenya environment for quicker services from government hence pressuring the government to improve service delivery by adopting and implementing e-government services. Kajiado North sub-county is quite vast and the road network is not properly developed. Because of this limitation, physical access to government service may prove slow and expensive and hence defeating the very purpose of devolution. For this reason it is important for government to implement mobile-based technology solutions so as to be able to reach the greatest number of people and avail an efficient mechanism for accessing services.

The problem of access to service due to poor infrastructure in Kajiado north sub-county has not been fully resolved by the decentralization programme christened huduma centers simply because there is only one such center in the entire Kajiado county. Business people and other citizens are adversely affected by the long distances they have to travel to receive even the simplest form of government services. According to GOK (2014), the ICT sector in Kenya grew at an average of nearly 20 per cent annually from 1999 to 2013. Internet usage rates for 2013 were around five for every ten adults. Person-to-person mobile money transactions at the end of 2010 were equivalent to around 20 per cent of the GDP with two of every three Kenyan adults being users. ICT has been one of the main drivers of Kenya’s economic growth over the last decade.

It is therefore evident that ICTs use among the citizen will increase in the future ther is no doubt that mobile based technologies will be the fastest and most efficient channel for public and private service delivery. This fact has not been truly reflected in Kajiado north sub-county. The 2013 statistics show that the ICTs forward and backward linkages have continued to improve at a national scale, with employment opportunities hitting over 150,000. For instance, there were 103,165 mobile money agents by June 2013. The rise in the number of agents indicates increased access of mobile money transfer services as well as creation of employment opportunities in ICT. It would be desirable to provide more services through mobile phone-based Technologies so that more people can access such services. The study sought to identify the factors influencing the adoption of mobile phone-based ICTs in delivery of public service to the residents of Kajiado north sub-county. The results of this study were important for policy makers so that they can understand how well public services can be delivered through the mobile phone in the days to come.

The general objective of this study was to determine the factors influencing adoption of mobile technologies in public service delivery in Kajiado north sub-county. The specific objectives of this study were to determine the contribution of performance expectancy in adoption of mobile-based technologies in Kajiado North sub-county, to examine the role of effort expectancy in adoption of mobile-based technologies Kajiado North sub-county, to establish the role of social influence in adoption of mobile-based technologies Kajiado North sub-county and to determine the contribution of facilitating conditions in adoption of mobile-based technologies Kajiado North sub-county

II. LITERATURE REVIEW

2.1 Theoretical framework

This section reviews the past studies on the field governance and mobile technologies and measures that have been found important in evaluating ICTs. The aspects of efficiency in public service delivery through mobile technologies discussed in this section include Performance expectancy, effort expectancy, social influence, and facilitating conditions in adoption mobile –based technologies (MBTs) in provision of public services.

This study found some relevant theories and models which best explain the relationship that exists between the independent variables and the dependent variable. These theories and models are the Diffusion of innovation theory and the unified Theory of and acceptance and use of technology (UTAUT).

2.1.1 Diffusion of Innovations Theory

One theory which attempts to understand the reasons why some people adopt new ideas more rapidly than others is the theory of diffusion of innovations. An innovation is an idea, behavior or object that is perceived as new by its audience (Rogers, 2003). According to Rogers (2003), the reasons why certain innovations spread more quickly than others is because of relative advantage, compatibility to existing values, simplicity and ease of use, trial ability and finally observable results. These are the qualities of an innovation which determine the rate at which such an innovation or idea will be accepted by users. Rogers postulates that these qualities account for 47-87% of the variation in adoption of new ideas. In this theory, re-invention is a key principle. This means that developers are always expecting users to provide new feedback and insights on how to develop the idea and make it better.

Relative advantage is described as the degree to which an innovation is perceived as better than the idea it supersedes by a particular group of users, measured in terms that matter to those users, like economic advantage, social prestige, convenience, or satisfaction. The greater the perceived relative advantage of an innovation, the more rapid its rate of adoption is likely to be (Rogers, 2003). There are no absolute rules for what constitutes “relative advantage”. It depends on the particular perceptions and needs of the user group. This quality is equivalent to what other theories term as performance expectancy (PE).

Compatibility with existing values and practices is the degree to which an innovation is perceived as being consistent with the values held as important by a group of people. An idea that is incompatible with their values, norms or practices will not be adopted as rapidly as an innovation that is compatible. Another quality which is shared by the diffusion theory and other theories is Simplicity.
and ease of use which is the degree to which an innovation is perceived as difficult to understand and use. According to Rogers (2003), new ideas that are simpler to understand are adopted more rapidly than innovations that require the adopter to develop new skills and understandings. This quality is also commonly referred to as Ease of Use in the other theories. Another quality of an idea as postulated by the Diffusion theory is trialability which is the degree to which an innovation can be experimented with on a limited basis. An innovation that is trialable represents less risk to the individual who is considering it for example in our case we might want to term Facebook and Twitter as trialable technologies because these applications come in-built with a majority of standard cell phones.

2.1.2 Unified Theory of Acceptance and Use of Technology (UTAUT)

This research project used the Unified Theory of Acceptance and Use of Technology (UTAUT) as a theoretical basis to conduct empirical research testing the factors that influence use of mobile technologies in the process of delivering public service in Kajiado North sub-county. Venkatesh et al. (2003) combined eight user acceptance and motivation models to propose the Unified Theory of Acceptance and Use of Technology. The eight theories are the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), the Motivational Model (MM), the Theory of Planned Behaviour (TPB), a combined theory of Planned Behaviour/Technology Acceptance Model (C-TPB-TAM), the Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT), and Social Cognitive Theory (SCT).

According to Venkatesh et al. (2003), UTAUT is comprised of a range of factors which are taken into consideration when evaluating the Behavioral intention to use and the level of acceptance of a particular technology or system. Derived from this, UTAUT suggests that four core factors are direct determinants of technology acceptance (behavioral intention) and use (behavior): These factors are made up of four different constructs used in measuring user acceptance and user behaviour and these include

- Performance Expectancy (PE)
  - Time saving
  - Accurate and reliable information

- Effort expectancy (EE)
  - Ease of use
  - Clarity of information

- Social influence (SI)
  - Family and relations
  - Influence by important people

- Facilitating conditions (FC)
  - Government encouragement
  - Availability of internet
  - Availability of training

2.2 Conceptual Framework

Adoption of mobile-based technologies in public service delivery
- Increase in adoption of mobile technologies by staff
- Increase of number online services
- Increase in government support

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Independent variables | Dependent variable
--- | ---

### 2.3 Empirical Review relevant to the study

Unlike many developed countries, a majority of the developing countries have very low levels of access to internet connection especially among the rural poor. Enough research has been done in the area of ICTs by researchers and analysts from all parts of the world. One area where a majority of them concur is that adoption of ICT approaches in governance comes with a multiplicity of benefits to governments, businesses and the citizens. Some of the benefits which accrue from the adoption of mobile based technologies (MBTs) in government improved efficiency of administrative processes, increased transparency by way of easy access to information by all, improved services delivery by eliminating queue and unnecessary waiting, decreased corruption, contribution to revenue growth and cost reductions especially in tax payments and collections.

Several studies have been conducted by various scholars to try and understand factors influencing adoption of technologies. Researchers who adopted the UTAUT model either use the same constructs proposed by Venkatesh et al. (2003) to make changes to the constructs to suit their respective context Suhonen (2015). In their study conducted in Uganda, Engotoit, Moya, Kituvi and Abima (2016) established a significant positive relationship between the independent variables of Performance Expectancy, Effort Expectancy, Social Influence and the dependent variable Behavioral Intentions to use as well as Behavioral intentions to use and adoption of MBTs which is also a dependent variable. The study further found a confirmatory significant positive relationship between Performance expectancy and Behavioral intentions to use, Effort Expectancy and Behavioral Intentions to use, Social Influence and Behavioral intentions to use and finally behavioral intentions to use and the adoption of MBTs.

According to Prensky (2001) in his study posits that young people today are all ‘native speakers’ of the digital language of computers. The youth frequently adopt new instructional technologies in learning and constructing knowledge. The transmission of general information through use of mobile technologies is more and more frequent today among young people who constitute the largest portion of our population. The young people spend considerable amounts of time and money staying connected with their friends through their mobile phones. It is hence more likely than not that they would prefer to be able to access government service and many other available services through the convenience of their phones.

Currently, approximately 90% of handset sales worldwide are for devices powered by Google's Android and apple's iOS mobile operating systems (Charles, 2013). These devices are what are commonly referred to as Smart phones and they come with a host of amazing capabilities. For this reason, majority of phone users are expected to be able to access internet and other mobile based technologies. The United Nations through the Department of Economic and Social Affairs (UNDESA) has been in the frontline in advocating for integration of ICTs into government service delivery and as a result, UNDESA has been publishing E-government surveys every two years since 2003. The UN body has been ranking the nations using an index known as EGDI (E-government development index) which is computed based on a nations achievement or score in relation to three components namely: human capital, Telecommunication Infrastructure Index (TII) and Online Service Index (OSI).

This means that a nation’s score is measured on three important dimensions namely: the availability of online services, telecommunication infrastructure and human capacity. The EGDI scores are categorized into Low - (below 0.25), Middle - between (0.25-0.5), High (0.5-0.75) and Very high (above 0.75). According to the EGDI survey of 2014, Kenya, Ethiopia, Sudan, Uganda and a majority of Sub-Saharan nations were ranked as Middle EGDI nations. The very high EGDI category was occupied largely by developed OECD nations like USA, Japan, South Korea and Singapore among others. In the Low EGDI category lies nations like Mozambique, South Sudan, Congo, and Afghanistan.

It is on this premise that devolution and a commitment to make service delivery available to the largest number of people is founded. According to the (KNBS, 2015) the Government of Kenya has identified Information and Communication Technology (ICT) as a key enabler to the attainment of the goals and aspirations of the Vision 2030. The thrust of the vision with regard to the ICT sector is to transform Kenya into a knowledgeable and information based economy by enabling access to quality, affordable and reliable ICT services in the country. The benefits associated with the use of modern technology in service delivery have given ICT prominence in the eyes of the public and decision makers. With the use of modern technology, communication has become more reliable, faster and affordable. The Government has also undertaken various measures aimed at developing the ICT sector. Some of the efforts put in place include the national broadband strategy as well as the facilitation of the migration from analogue to digital platform.

### 2.4 Critique of existing Literature

According to Suhonen et.al (2015), findings of studies that have employed UTAUT vary according to diverse context of study and the Information Technology system under study. For example one study on Educational Technology, adopted UTAUT model to estimate the driving factors that influence user acceptance of web base question-answer system (WBQAS) in China. The study revealed that Performance Expectancy, Facilitating Conditions and Effort Expectancy were significant predictors of the Behaviour intention (BI) to use the system. On the contrary, Social Influence had no significant impact on the BI to use WBQAS. In a related study, Marchewka, Liu, and Kostiwa (2007) found EE and SI to be significant in predicting use behaviour in a study conducted in US towards describing students' perceptions of using course management software application. Also, Cheng et al. (2007) while investigating whether the differences in gender, age and occupation for m-learning influences the use of mobile device found out that SI has positive effect on BI to use m-learning with females having the higher influencing index.

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Rogers (2003) in his book Diffusion of innovations postulates that the five qualities of innovation namely; relative advantage, compatibility with values, simplicity and ease of use, trial ability and observable results are the only determinants of the speed at which innovations can diffuse in a population. He goes further to mention that these qualities account for 48-87% of the variation in the adoption of new ideas and technologies. This argument fails to address critical contributing factors such as social influence and facilitating conditions.

In addition, most of the studies conducted with an attempt to study technology acceptance have largely been done on students in academic settings. For these reasons, the researcher finds it more appropriate to make use of the UTUAT model to better study the relationship which exists between the independent and dependent variables.

Kenya is in the infancy of devolution and a new constitutional dispensation. Technology is seen as the key to success in service delivery efficiency. As counties rush towards embracing top-notch technologies, Kajiado North sub-county will have no much choice but to follow suit. Mombasa and Nairobi counties have led the way in developing mobile based solutions for service delivery.

This research sought to identify the factors that influence adoption of mobile-based technologies (MBTs) in Kajiado-North sub-county with the view of availing the requisite information to the policy makers and other interested parties. No similar study has been carried out in this administrative area on a cross-departmental scope and hence this study will provide a basis upon which further research can be carried out.

III. RESEARCH METHODOLOGY

This study used a descriptive design. The major purpose of a descriptive research study is to describe a state of affairs as it exists at present. According to Copper and Schindler (2006), the main feature of descriptive research is that the researcher has no control over the variables; he/she can only report what has happened or what is happening. In this case, we attempted to examine the concerned people’s opinion and feelings towards adoption of mobile technologies in public service delivery in Kajiado North sub-county.

In this study the researcher described ‘what exists’ with respect to the stated variables. The researcher will have no control over these variables. In descriptive design, the problem is structured and well understood (Ghauri & Gronhaug, 2010). Descriptive research portrays an accurate profile of persons, events or situations (Robson, 2002). This method is preferred because it will give a report of things as they are. Additionally, high reliability is easy to obtain by presenting all subjects with a standardized stimulus which ensures that observer subjectivity is greatly eliminated (Mugenda & Mugenda, 2008).

According to Cooper and Schindler (2006), a population is the total collection of elements about which we wish to make some inferences. In this study, the population was all 65 senior government officials comprising of county executives, heads of departments and their deputies working for both county and national government in Kajiado north sub-county. These people are considered appropriate for this study because they are the ones that are in-charge of the various departments in the sub-county and are expected to be at the forefront in ensuring improved service delivery in-line with the government commitment to Vision 2030 goals.

According to Mugenda (2008) sampling is the process of selecting a number of individuals for a study in such a way that the individuals selected represent the large group from which they were selected. She also recommended that a 10% to 30% sampling from every group of the population will give a more representation of the whole population. The researcher used a simple random sampling technique to select a sample from the population. For a design to be called random sampling or probability sampling, it is imperative that each element in the population has an equal and independent chance of selection in the sample (Kumar, 2011).

Table: 3.1: Population of study

<table>
<thead>
<tr>
<th>Level</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head of departments</td>
<td>25</td>
</tr>
<tr>
<td>Deputy head of departments</td>
<td>25</td>
</tr>
<tr>
<td>Administrators</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>65</td>
</tr>
</tbody>
</table>

According to Mugenda (2008) sampling is the process of selecting a number of individuals for a study in such a way that the individuals selected represent the large group from which they were selected. She also recommended that a 10% to 30% sampling from every group of the population will give a more representation of the whole population.

The study employed simple random sampling to select the sample for the research. This involved sampling from the list of all county executives, heads and deputy heads of government departments in Kajiado North sub-county. This is as per the sampling frame provided by the county human resource department. The sample was selected with a significance level of 5% using the following formula:

\[
\text{Sample Size} \ (n) = \frac{N}{1 + \left(\frac{N}{n}\right)^2}
\]

Where:
- \(n\) = sample size
- \(N\) = population size

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C = confidence interval, expressed as decimal (.1)
\[ n = \frac{65}{(1 + \frac{65}{.1})^2} \]
The researcher used questionnaires in collecting the primary data. A questionnaire consists of a set of well formulated questions to probe and obtain response from respondents and collect all the data items which are required for testing hypothesis and other tests relating to various research issues. Self-administered questionnaires were used because they encourage consistency in asking questions and it is easy to analyze the yielded data (Bhattacherjee, 2012). Questionnaires were structured with background questions and study variable questions adopted from the UTAUT model with modification which was used to collect data on the factors influencing the adoption of Mobile-based technologies (MBTs) in public service delivery in Kajiado North sub-county. Adequate time was given for the respondent to answer questions adequately. The questionnaires were hand delivered to the 40 respondents and collected after they are filled.

Before the actual research, the researcher conducted a pilot testing on randomly selected heads of departments from the sub-county. The results of the pilot test were used to test for face validity, content validity and construct validity of the instruments. This also determined the reliability of the research instrument. It was used to determine the ease of use of the instruments, to detect any weakness like ambiguous statements, to determine whether the respondents can understand the questions, language, any errors or flaws. This helped the researcher to take corrective measures in order to make improvements where required. The purpose of the pilot study was to test the validity of research instruments as well as to check the presence of ambiguity and researcher’s bias (Ghauri & Gronhaug, 2010). The pilot study also assessed the feasibility of the study, based on the locale and the nature of the sample. It also helped to identify the ambiguity of items in the instruments. The feedback helped to improve the research instruments.

Validity is the degree to which a test measures what it purports to measure (Copper & Schindler, 2006). They define validity as the accuracy and meaningfulness of the inferences which are based on the research results. It is the degree to which results obtained from the analysis of the data actually represents the phenomena under study. The scholars contend that the validity of the questionnaire data depends on the crucial way the ability and willingness of the respondents to provide the required information. The scholars also state that the usual procedure in establishing the validity of a measure is for example, to use professionals and experts in the particular field. The researcher established the validity of the research instrument from the pilot study and opinions of experts from Kajiado North sub-county.

Mugenda (2008), defines reliability as the consistently and dependability of data collected through repeated use of a scientific instrument or data collection procedure under the same conditions. The researcher used the Cronbach’s Alpha in measuring the reliability of the instrument of the study.

\[ R = k / k - \frac{1}{\sum \frac{\sigma_i^2}{\sigma y^2}} \]
where;
\[ K = \text{Total number of items in the list}, \]
\[ \sigma_i^2 = \text{Variance of individual items} \]
\[ \sigma y^2 = \text{Variance of total test scores} \]

The researcher first obtained an introduction letter addressed to the Kajiado North Sub-county administrator from the University Department of Human Resource Development once the research proposal is approved. Primary data was collected through the questionnaire to assist in answering the research questions. A questionnaire was used to collect data from the respondents and it will have both close-ended and open-ended. The close-ended questions assisted in limiting responses in some cases while the open-ended questions allowed the subjects some degree of freedom to provide information in their own words. Likert scale was also used with an aim of weighing factors according to their importance as perceived by the respondents in relation to the variables. The choice of the questionnaire is based on the view that it is easy to administer and the data is easy to analyze (Mugenda & Mugenda, 2003).

Data was gathered by use of structured open and closed ended questionnaire. The respondents were briefly introduced to the purpose of the study before administering the questionnaires. The researcher explained to the respondents the nature and importance of the study during pilot and actual study. Confidentiality was assured to the respondents whereby this was stated in a letter that accompanied each questionnaire. Secondary data was obtained from books and journals.

To ascertain the correlation coefficient between the independent variables and dependent variable, data was analyzed qualitatively and quantitatively to address research objectives. This was done using statistical results package for social science (SPSS) as a tool. Descriptive statistics were used to present the results, which will be tabulated in frequency distributions, percentages and graphs. For inferential statistics, the study employed multiple regression analysis to establish the existing relationships between the independent variables (performance expectation, effort expectation, social influence and facilitating conditions) and the independent variable - adoption of mobile technologies. Regression analysis was used to determine the type or relationship between the variables. This assisted in determining the level of influence the independent variables on the dependent variable. The following model was employed.

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\[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon \]

Where:

- \( Y \) = Adoption of mobile technologies
- \( \beta_0 \) = Constant Term
- \( \beta_1, \beta_2, \beta_3 \) = Beta coefficients
- \( X_1 \) = Performance expectation
- \( X_2 \) = Effort expectation
- \( X_3 \) = Social influence
- \( X_4 \) = facilitating conditions
- \( \varepsilon \) = Error

IV. FINDINGS, SUMMARY, CONCLUSIONS, RECOMMENDATIONS AND AREAS OF RESEARCH

4.1 Findings on Background Information

4.1.1 Response Rate

The study targeted 40 respondents in the collection of data about the factors influencing adoption of mobile technologies in public service deliver in Kajiado North sub-county. In the study all the respondents involved participated in filling out the study thus the response rate was 100%.

4.1.2 Reliability and Validity

Reliability is the extent to which a measuring instrument contains variable errors that appear inconsistently from observation during any one measurement attempt or that vary each time a given unit is measured by the same instrument. Construct validity can be ascertained by relating measuring instruments to a general theoretical framework so as to determine if the instrument is related to the concepts and theoretical assumptions they are using (Nachmias & Nacmias, 2008). SPSS version 22 was used to analyze the relationship that exists between the dependent variable and the four independent variables shown in the diagram below. A Cronbach’s alpha test was done. Most of the values had a high Cronbach alpha value (above 0.7) which indicated that the instrument was sufficiently suitable for use in the measurement. Thus the construct validity of the data collection instrument was reasonable (Brown, 2000).

<table>
<thead>
<tr>
<th>Variable/Construct Description</th>
<th>Item mean values</th>
<th>Item standard deviations</th>
<th>Coefficient Reliability</th>
<th>Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Expectancy</td>
<td>3.75</td>
<td>.500</td>
<td>0.836</td>
<td></td>
</tr>
<tr>
<td>Effort Expectancy</td>
<td>3.75</td>
<td>.500</td>
<td>0.839</td>
<td></td>
</tr>
<tr>
<td>Social Influence</td>
<td>3.25</td>
<td>.957</td>
<td>0.765</td>
<td></td>
</tr>
<tr>
<td>Facilitating Conditions</td>
<td>1.50</td>
<td>.577</td>
<td>0.944</td>
<td></td>
</tr>
<tr>
<td>Performance Expectancy</td>
<td>3.75</td>
<td>.500</td>
<td>0.836</td>
<td></td>
</tr>
</tbody>
</table>

4.1.3 Gender of the respondents

Most of the respondents (52%, n=21) were male whereas 48% (n=19) were female.
4.1.4 Age of the respondents

Most of the respondents (42%) were in the age category of 26-35 years, 30% were in the age category of 36-50 years, 18% were in the age category of 18-25 years whereas 10% were above 50 years of age.

4.1.5 Highest education level

The study wanted to assess the highest level of education that the respondents had attained. The study findings revealed that 50% of the respondents had a diploma, 37.5% of the respondents had a degree, 7.5% of the respondents had a certificate whereas 5% of the respondents had a master’s degree.

4.1.6 Length of working experience
The study sought to find out the length of working experience among the respondents. The study findings indicated that 37.5% of the respondents had worked for 5-10 years, 27.5% of the respondents had worked for 3-5 years, 17.5% of the respondents had worked for over ten years, 12.5% of the respondents had worked for 5-10 years whereas 5% of the respondents had worked for less than a year.

![Figure 4.3: Length of working experience](image)

4.2 Findings on Specific Objectives
4.2.1 Application of mobile-technologies in the organization
4.2.1.1 Familiarity with mobile technologies

The study sought to find out which mobile technologies the respondents were familiar with. The study findings revealed that all the respondents were familiar with Short Messaging Services (SMS), 97.5% of the respondents were familiar with Whatsapp, 82.5% of the respondents were familiar with Facebook, 72.5% of the respondents were familiar with Instagram, 47.5% of the respondents were familiar with Twitter whereas 7.5% of the respondents were familiar with other mobile technologies like Snapchat, Messenger and Uber.

![Figure 4.4: Mobile Technologies Familiar with](image)
4.2.1.2 Have official mobile phone to execute duties

The study showed that most of the respondents (80%) had an official phone to execute their daily duties.

![Figure 4.5: Possession of official phone to execute duties](image)

The study also sought out to find out if the official mobile phone was a smart phone. 97% of the respondents stated that the official phone they had was a smart phone.

![Figure 4.6: Official phone is smart phone](image)

4.2.1.3 Official uses for phone

The study sought to find out the official uses of the phones that the employees had. The study found out that 72.5% of the respondents used their mobile phones to communicate to colleagues on SMS to pass information, 62.5% of the respondents used their mobile phones to send and receiving instant messages on Whatsapp, 60% of the respondents used their mobile phones to send and receiving important photos on Whatsapp, 50% used their mobile phones to send and receive emails, 47.5% of the respondents used their mobile phones to receive and pass information to the public whereas 45% of the respondents used their phones to received queries and complains from the public.

![Figure 4.7: Official uses for phone](image)

4.2.2 Performance Expectancy

4.2.2.1 Impact on speed, accuracy and reliability of services by use of mobile technologies
97% of the respondents agreed that the services in the department would be faster, more accurate and reliable if the public could access the service through mobile technologies like SMS.

Figure 4.8: speed, accuracy and reliability of services by use of mobile technologies

4.2.2.2 Indicators of performance expectancy

The first objective of the study was to determine the contribution of performance expectancy in adoption of mobile-based technologies in Kajiado North sub-county. The respondents were served with questions and statements that were targeted to answering this research question. The mean values in the tables were interpreted using the following range, 0-1.0 – Strongly disagree, 1.1-2.0 – Disagree, 2.1-3.0 – Moderately disagree, 3.1-4.0 – Agree and 4.1-5.0 – Strongly agree. The standard deviation was used to determine the closeness of the data to the mean and thus the accuracy of the mean. A standard deviation that was less than 1.5 was considered to be an indication that the values were closer to the mean. The findings of the study are discussed in the sections below as they were presented in the questionnaire.

The study results revealed that the respondents strongly agreed that; mobile phone technologies like Whatsapp and SMS are expected to ease service delivery if put to good use by government officials as shown by a mean of 4.68 and a standard deviation of 0.526 which is a small deviation, indicating that most of the values were near the mean. The study findings also revealed that a majority of the respondents strongly agree that services offered via mobile technologies are normally accurate and reliable, as shown by a mean of 4.1 and a standard deviation of 1.08 which is small meaning that data had values was close to the mean.

The study findings also showed that most of the respondents strongly agreed that a majority members of the public have mobile phones and passing information to & from is easy through mobile technologies like SMS and Whatsapp, as shown by a mean of 4.18 and a standard deviation of 0.90 which is small meaning that data had values was close to the mean.

According to the study findings, most of the respondents agreed that services offered online come with clear user instructions to enable ease of use and this is shown with a mean of 3.55 and a standard deviation of 1.19 which is a small value meaning that it was close to the mean.

Table 4.2: Indicators of performance expectancy

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Moderately agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Mean</th>
<th>Std Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile phone technologies are expected to ease service delivery if put to good use by government officials</td>
<td>0</td>
<td>0</td>
<td>2.5</td>
<td>27.5</td>
<td>70</td>
<td>4.68</td>
<td>0.526</td>
</tr>
<tr>
<td>Services offered via mobile technologies are normally accurate and reliable</td>
<td>2.5</td>
<td>5.0</td>
<td>22.5</td>
<td>20</td>
<td>50</td>
<td>4.1</td>
<td>1.08</td>
</tr>
<tr>
<td>Most members of the public have mobile phones and passing information to &amp; from is easy through mobile technologies</td>
<td>0</td>
<td>5.0</td>
<td>17.5</td>
<td>32.5</td>
<td>45</td>
<td>4.18</td>
<td>0.90</td>
</tr>
<tr>
<td>Services offered online come with clear user instructions to enable</td>
<td>2.5</td>
<td>20</td>
<td>27.5</td>
<td>20</td>
<td>30</td>
<td>3.55</td>
<td>1.19</td>
</tr>
</tbody>
</table>
4.2.3 Effort Expectancy
4.2.3.1 Ease and helpfulness of mobile technologies in accessing services

Regarding whether most citizens would find it easier to use mobile technologies most of the respondents (92%) stated that they would find it easier.

![Figure 4.8: Ease and helpfulness of mobile technologies in accessing services](image)

4.2.3.2 Effort Expectancy Indicators

The second objective of the study was to examine the role of effort expectancy in adoption of mobile-based technologies in Kajiado North sub-county. The study sought to investigate the extent to which respondents agreed with the role of effort expectancy in adoption of mobile-based technologies in Kajiado North sub-county. The mean values in the tables were interpreted using the following range, 0-1.0 – Strongly disagree, 1.1-2.0 – Disagree, 2.1-3.0 – Moderately disagree, 3.1-4.0 – Agree and 4.1-5.0 – Strongly agree. The standard deviation was used to determine the closeness of the data to the mean and thus the accuracy of the mean. A standard deviation that was less than 1.5 was considered to be an indication that the values were closer to the mean.

The study findings showed that most of the respondents strongly agreed that the use of mobile technologies has become a very common means of providing essential services both in the public, as shown by a mean of 4.75 and a standard deviation of 0.494 which is small meaning that the data had values that were closer to the mean.

The study findings also showed that most of the respondents strongly agreed that most people can use mobile technologies like SMS and WhatsApp with ease as shown by a mean value of 4.0 with a standard deviation of 0.934 which is small thus it shows that most of the values were closer to the mean values. As per the study findings most of the respondents agreed that many citizens access the Internet via mobile networks as indicated by a mean of 3.33 and a standard deviation of 1.289 which is small thus indicated that most of the data values were close to the mean.

The study findings also revealed that most of the respondents strongly agreed that mobile technologies like SMS and WhatsApp are considered by many to be faster, easier and cheaper to use as shown by a mean of 4.08 and a standard deviation of 0.89 which is small thus indicating that most of the data values were close to the mean.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Moderately agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Mean</th>
<th>Std Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of mobile technologies has become a common means of providing essential services both in the public and private sectors</td>
<td>0</td>
<td>0</td>
<td>2.5</td>
<td>20</td>
<td>77.5</td>
<td>4.75</td>
<td>0.494</td>
</tr>
<tr>
<td>Most people use mobile technologies like SMS and Whatsapp with ease</td>
<td>0</td>
<td>10</td>
<td>12.5</td>
<td>45</td>
<td>32.5</td>
<td>4.00</td>
<td>0.934</td>
</tr>
<tr>
<td>Many citizens access the Internet via mobile networks</td>
<td>7.5</td>
<td>22.5</td>
<td>25</td>
<td>20</td>
<td>25</td>
<td>3.33</td>
<td>1.289</td>
</tr>
<tr>
<td>Mobile technologies like</td>
<td>0</td>
<td>7.5</td>
<td>12.5</td>
<td>45</td>
<td>35</td>
<td>4.08</td>
<td>0.89</td>
</tr>
</tbody>
</table>

Table 4.3: Effort Expectancy Indicators
SMS and WhatsApp are considered by many to be faster, easier and cheaper to use.

### 4.2.3.3 Services that can be offered via mobile phones

In regard to the services that can be offered via mobile phones the respondents stated the following services: payments of services and bill request (25%), alerts (25%), status updates on various things (12.5%), getting reports (10%), all services (5%), cash disbursements to the elderly (2.5%), field data collection (2.5%) and advertisements (2.5%). A small number of the respondents (10%) stated that they would not recommend any services to be offered via mobile phones.

<table>
<thead>
<tr>
<th>Table 4.4: Services that can be offered via mobile phones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
</tr>
<tr>
<td>Valid</td>
</tr>
<tr>
<td>ADVERTISEMENTS</td>
</tr>
<tr>
<td>ALERTS ON THINGS LIKE: SEMINARS AND NEW PROGRAMS, COMMUNITY POLICING, LIVESTOCK DISEASE OUTBREAKS, HEALTH EDUCATION, BEST PRACTICES</td>
</tr>
<tr>
<td>ALL SERVICES</td>
</tr>
<tr>
<td>CASH DISBURSEMENT TO THE ELDERLY</td>
</tr>
<tr>
<td>FIELD DATA COLLECTION</td>
</tr>
<tr>
<td>GETTING REPORTS E.G. ON WATER LEAKS, HEALTH RECORDS EMERGENCIES, BUILDING REGULATIONS</td>
</tr>
<tr>
<td>NONE</td>
</tr>
<tr>
<td>PAYMENT OF SERVICES AND BILL REQUESTS</td>
</tr>
<tr>
<td>STATUS UPDATE ON JOBS AND TENDER PREQUALIFICATION</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

### 4.2.4 Social Influence

#### 4.2.4.1 Awareness of a department that uses mobile technology for delivering service to the public

All the respondents (100%) knew a department that uses mobile technology to deliver services to the public.

#### 4.2.4.2 Social influence indicators

The research sought to establish the role of social influence in adoption of mobile-based technologies Kajiado North sub-county. The respondents were asked to respond to some statements and questions regarding social influence indicators. The mean values in the tables were interpreted using the following range, 0-1.0 – Strongly disagree, 1.1-2.0 – Disagree, 2.1-3.0 – Moderately disagree, 3.1-4.0 – Agree and 4.1-5.0 – Strongly agree. The standard deviation was used to determine the closeness of the data to the mean and thus the accuracy of the mean. A standard deviation that was less than 1.5 was considered to be an indication that the values were closer to the mean.

As per the study findings most of the respondents agreed that they had started using mobile technologies when they realized most of their colleagues were using them, as shown by a mean of 3.90 and a standard deviation of 1.47 which is small and it indicated that most of the data values were closer to the mean.

The study findings showed that most of the respondents strongly agreed that departments using mobile technologies for service delivery are more efficient than those that do not, as depicted by a mean of 4.23 and a standard deviation of 0.891 which is small and shows that most of the data values were closer to the mean.

As per the study findings most of the respondents strongly agreed that most people learn about mobile technologies from relatives and friends, as shown by a mean of 4.68 and a standard deviation of 0.944 which is small thus indicating that the a majority of the data values are close to the mean value.

According to the study findings most of the respondents disagreed that the organization offers training via workshops to educate people on how to access various services on the online platform, as shown by a mean value of 1.95 and a standard deviation of 1.36 which is small thus shows that most of the data values were closer to the mean values.

<table>
<thead>
<tr>
<th>Table 4.5: Social influence indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statement</td>
</tr>
<tr>
<td>Started using mobile technologies when I realized most of my</td>
</tr>
</tbody>
</table>

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4.2.4.3 Facilitating conditions

The research sought to determine the contribution of facilitating conditions in adoption of mobile-based technologies Kajiado North sub-county. The respondents were asked to respond to some statements and questions regarding social influence indicators. The mean values in the tables were interpreted using the following range, 0-1.0 – Strongly disagree, 1.1-2.0 – Disagree, 2.1-3.0 – Moderately disagree, 3.1-4.0 – Agree and 4.1-5.0 – Strongly agree. The standard deviation was used to determine the closeness of the data to the mean and thus the accuracy of the mean. A standard deviation that was less than 1.5 was considered to be an indication that the values were closer to the mean.

According to the study findings most of the respondents disagreed that the department provides mobile phones for official use, as shown by a mean of 1.53 and a standard deviation of 1.10 which is small thus indicated that most of the data values were close to the mean. The study findings revealed that most of the respondents disagreed with the statement that employees get refunds for money used for airtime to offer public services to the public, as indicated by a mean of 1.53 and a standard deviation of 0.987 which is small thus shows that most of the raw variables were close to the mean value.

As per the study findings a majority of the respondents disagreed with the statement that offices have reliable wireless internet that facilitates public service delivery, as shown by a mean of 1.83 and a standard deviation of 1.28 which is small thus showing that most of the data values were close to the mean value. The study findings also showed that most of the respondents disagreed with the statement that the office supports and encourages public to seek services via mobile phones, as shown by a mean of 1.88 and a standard deviation of 1.29 which is small and shows that most of the data values are close to the mean value.

The study findings highlighted that most of the respondents disagreed with the fact that the office provides training on use of mobile technologies, as shown by a mean of 1.65 and a standard deviation of 1.21 which is small thus indicates that the data values are close to the mean values.

Table 4. 6 Facilitating conditions

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Moderately agree</th>
<th>Agree</th>
<th>Strongly Agree</th>
<th>Mean</th>
<th>Std Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department provides mobile phones for official use</td>
<td>72.5</td>
<td>17.5</td>
<td>2.5</td>
<td>0</td>
<td>7.5</td>
<td>1.53</td>
<td>1.10</td>
</tr>
<tr>
<td>Employees get refunds for money used for airtime to offer public services to the public</td>
<td>67.5</td>
<td>22.5</td>
<td>5</td>
<td>0</td>
<td>2.5</td>
<td>1.53</td>
<td>0.987</td>
</tr>
<tr>
<td>Offices have reliable wireless internet that facilitates public service delivery</td>
<td>60</td>
<td>20</td>
<td>5</td>
<td>7.5</td>
<td>7.5</td>
<td>1.83</td>
<td>1.28</td>
</tr>
</tbody>
</table>
Office supports and encourages public to seek services via mobile phones

Office provides training on use of mobile technologies

<table>
<thead>
<tr>
<th></th>
<th>52.5</th>
<th>32.5</th>
<th>0</th>
<th>5</th>
<th>10</th>
<th>1.88</th>
<th>1.285</th>
</tr>
</thead>
</table>

4.2.5 Regression Analysis

The researcher also conducted multiple linear regression to test the relationship between the dependent and independent variables. Statistical package for social sciences (SPSS) was used to code, enter and compute the values of multiple regressions for the study.

Table 4. 7: Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.712</td>
<td>.601</td>
<td>.311</td>
<td>.482</td>
</tr>
</tbody>
</table>

The degree of variation in the dependent variable (adoption of mobile technologies) due to variation in the independent variables (performance expectation, effort expectation, social influence and facilitating conditions) can be explained by the coefficient of determination.

The four independent variables that were studied, explained only 60.1% of the adoption of mobile technologies as shown by the $R^2$. This means that the other variables that were not covered in this study scope accounts for 39.9% of the variation in adoption of mobile technologies.

Therefore, more research should be done to ascertain the other challenges (37.9%) that influences the adoption of mobile technologies in Kajiado North Sub-county.

Table 4. 8: ANOVA

<table>
<thead>
<tr>
<th>Model</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>6.582</td>
<td>4</td>
<td>1.645</td>
<td>7.042</td>
<td>.000</td>
</tr>
<tr>
<td>Residual</td>
<td>11.600</td>
<td>50</td>
<td>.232</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>18.182</td>
<td>54</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Research, 2017

The model is statistically significant since it has a significant value of .000 (which is less than 0.05). The F critical at 5% level of significance was 3.23. Also, since the F calculated was greater than the F critical the overall model was significant.

Table 4. 9: Coefficients of determination

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
</tr>
<tr>
<td>(Constant)</td>
<td>1.732</td>
<td>.546</td>
</tr>
<tr>
<td>Performance Expectation</td>
<td>.126</td>
<td>.131</td>
</tr>
<tr>
<td>Effort Expectation</td>
<td>.461</td>
<td>.152</td>
</tr>
<tr>
<td>Social Influence</td>
<td>.072</td>
<td>.113</td>
</tr>
<tr>
<td>Facilitating Conditions</td>
<td>.149</td>
<td>.095</td>
</tr>
</tbody>
</table>

As per the SPSS generated table 4.8, the multiple linear regression equation $Y=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta X_4 + \epsilon$ becomes:

$Y= 1.732 + .126 X_1 + .461 X_2 + .072 X_3 + .149 X_4 + \epsilon$

Where $Y$ represents the dependent variable (Adoption of mobile technologies), $X_1$ is the performance expectation, $X_2$ is effort expectation, $X_3$ is social influence and $X_4$ is facilitating conditions.

Going by the regression equation above, taking all the variables in to account constant zero, adoption of mobile technologies will be 1.732. From the analysis, taking all the independent variables to be zero, a unit increase in performance expectation will lead to 0.126 increase in adoption of mobile technologies. A unit increase in effort expectation will lead to a 0.461 increase in adoption of
mobile technologies. A unit increase in social influence will lead to a 0.072 increase in adoption of mobile technologies. A unit increase in facilitating conditions will lead to a 0.149 increase in adoption of mobile technologies.

From the linear regression results performance expectation contribute more towards the adoption of mobile technologies followed by facilitating conditions, then performance expectation and lastly social influence.

At 5% significance level and 95% level of confidence, performance expectation had a 0.012 level of significance, effort expectation had a 0.005 level of significance and social influence had a 0.016 level of significance whereas facilitating factors had a 0.011 level of significance.

4.2 Summary of the Findings

4.2.1 Performance Expectation

The study found out that performance expectation had a positive influence on adoption of mobile technologies because p value = 0.012. The findings of the study was further in agreement with Alwahaishi and Snášel (2013) who reiterated that performance expectancy was one of the factors that had the strongest significant effect on the behavioral intentions towards the use of mobile Internet.

4.2.2 Effort Expectation

The study revealed that effort expectation had a positive influence on the adoption of mobile technologies in Kajiado North Sub-County (p-value=0.005). This in agreement with a study done by Oye et al. (2014) which showed that the expectation of effort was one of the main predictors to the acceptance and use of technology.

4.2.3 Social Influence

The study findings showed that social influence also had a positive impact on the adoption of mobile technologies in Kajiado North Sub-County (p-value=0.016). These findings are in agreement with a study done by Talukder and Quazi (2011) which noted that social network affects the attitudes toward an innovation. This in turn, impacts on how employees adopt to new innovative technologies. The study also showed that the social network was found to directly affect the innovation adoption process.

4.2.4 Facilitating factors

The study findings revealed that social influence also had a positive impact on the adoption of mobile technologies in Kajiado North Sub-County (p-value=0.011). This is in agreement with a study done by Im, Hong and Kang (2011) which noted that the facilitating condition for a technology is positively correlated with the use of technology. The study also stated that if there are more conditions that support the use of a technology, then people would be more likely to adopt the technology regardless of the country they are in.

4.3 Conclusion

From the research findings above the study concludes that there will be better adoption of mobile technologies in public service delivery if employees are empowered to use mobile technologies like SMS and Whatsapp to carry out their day to day activities. These technologies can be used to get information from the public and also disperse information to them via platforms like social media or messaging applications like Messenger and SMS.

If the employees are empowered on how to use mobile technologies to ease their work then they are also more likely to adopt the mobile technologies to do their job since they make the job easier to do. If there is enough social influence from other departments in their use of mobile technologies to deliver services to the public then this can trigger an overall desire to implement the same in all the departments thus make public service delivery more efficient and increase adoption of mobile technologies. In the presence of various facilitating factors created by the administration then employees will readily adopt new mobile technologies for use in their work.

4.4 Recommendations

From the conclusions above the study recommends that the county government should empower their employees through trainings on how to use mobile technologies in delivering services to the public. This can also include lessons on how to use social media and messaging applications to carry out their services in a fast and effective manner.

The study also recommends that the national government runs a pilot program in one of the departments to test the impact of mobile technologies on service delivery. Once the pilot is successful then this model can be replicated across all the other departments so that the employees can benefit from the use of mobile technologies in public service delivery.

4.5 Suggestion for Further Studies

The study focused on four challenges (variables) which only influence 60.1% of the adoption of mobile technologies in public service delivery in Kajiado North Sub-County. Further studies should be conducted to establish other challenges (38.9%) influencing the adoption of mobile technologies in public service delivery especially in other counties for purposes of comparison and making recommendations for improvement
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[22] Approaches, Acts Press Nairobi


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Factors Affecting Staff Service Delivery in State Corporations: 

A Case of Water Resources Management Authority, Nairobi County, Kenya

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Abstract - This study focused on factors that affect employees’ service delivery in State Corporation. Specifically, the study examined the following variables; Job description, working relationships, staff turnover and staff motivation. The scope of the study was the water resources management authority in Nairobi County, Kenya. The research employed a descriptive design comprising of both quantitative and qualitative data collection approach. A total of 138 employees from both administrative and technical departments were interviewed. Since the target population was made up of heterogeneous SMEs, both stratified and simple random sampling techniques were used in the study. In selection for sampling techniques, this study was concerned with the principle that the sample had to reflect the population. Primary Data was collected using Questionnaires which were both closed ended and open ended, where descriptive statistics were utilized to organize and describe the data while excel computer package was used to present the analysis in tables, pie charts and bar graphs. The study found out that job description had a positive coefficient which shows that it was directly proportional to service delivery. The study also established that working relationship and staff turnover had a negative coefficient which means that any decrease in working relationships and staff turnover led to increase in service delivery. The study also found out that staff motivation had a positive coefficient which shows that it was directly proportional to service delivery. It is recommended that state corporations do capacity building, job descriptions, reduce working relationships and reduce staff turnover levels by motivation factors. Further studies are recommended on the same research but data to be collected from different sources such as various state corporations in Kenya so as to enable better generalization of the results. Also, further research is recommended to determine other factors that affect service delivery in state corporations in Kenya other than those covered in this study.

Index Terms - Service delivery, State Corporations, Staff Turnover, Performance

I. INTRODUCTION

Borman and Motowidlo (2013) defined job performance as individual’s behaviour related to organisation goals and their behaviour can be evaluated by the individual’s contribution on organisation’s achievements. It is the quantity and quality of the achievement that an individual or a group contributes to the organisation. According to Schermerhorn, Hunt and Osborn (2014), the main factors that affect employees’ performance include job motive, skill, ability, role consciousness and motivation. These factors are essential for performance. Hackman and Oldham (2006) identified skill variety, task identity, task significance, autonomy and feedback as having an effect on critical psychological states. The researchers listed working relationships, staff turnover and motivation as the factors that were found to have a detrimental effect on performance. Job satisfaction is typically measured in levels and can be examined from multiple viewpoints using multiple constructs or categories as motivation and hygiene factors. According to Herzberg (2012), motivation factors deal with job content and lead to job satisfaction, consist of growth; work itself, responsibility, achievement, advancement, and recognition. Hygiene factors deal with job context and lead to job dissatisfaction consist of company policy and administration, supervision, interpersonal relations, status, working condition, security, and salary.

In a comprehensive review of studies, Judge, Thoresen, Bono and Patton (2006) found that when the correlations are appropriately corrected for sampling and measurement errors, the average correlation between job satisfaction and job performance was higher. In addition, the relationship between job satisfaction and performance was found to be even higher for complex jobs than for less complex jobs. Thus, contrary to earlier reviews, it does appear that job satisfaction is, in fact, predictive of performance, and the relationship is even stronger for professional jobs. As a result, it could be concluded that job satisfaction is shown to be positively associated with job performance.

Rehman et al. (2010) pointed out interpersonal relationships, insufficient resources, lower salaries and heavy work load as the major stressors which cause stress.
Occupational Stress Factsheet, (2006) described the insecurity of job, high workload, time pressure, little control over job, insufficient job resources and understaffing as the sources/causes of stress. Stavroula et al. (2011) provided poor work, poor management and unsatisfied working conditions as the root causes of stress. They emphasized that less the mismatch between work demands and pressure and worker capabilities less will be the stress and vice versa. Less support of colleagues is another source of stress as well.

Water Resources Management Authority (WRMA) is a state corporation that was established in July 2005 under the provision of the Water Act 2002 of the Laws of Kenya. The Authority is a non-profit, service oriented corporate body under the Ministry of Water and Irrigation. Its mandate is to provide leadership in the management of water resources nationally. It’s also subject to the State Corporations Act which guides all state corporations in Kenya (WRMA service charter, 2011). WRMA has been going through a restructuring programme which commenced in the year 2011 (www.wrmor.ke).

As part of the process, some staff members have been moved to other duty stations, while new ones have been recruited. Regular transfer of staff has greatly affected the work process and caused a lot of stress to employees who have to cope with new work environment and relocate their families. In some cases, the transfers have led to separation of families and reduced income due to deductions in house allowances. This has greatly affected the health of employees leading to increased incidents of stress related ailments. Information available in the public domain is that there has been an increase in the number of job description related sicknesses such as hypertension, high blood pressure and diabetes. This is because the workload in most job descriptions is unrealistic causing stress to the designated employees.

On the other hand, staff seeking counselling services due to personal and job related issues has also been reported. There has been an increase in the indicators of stress related issues such as absenteeism, work conflict and apathy among staff. There has also been an increase in people seeking to move from their current stations due to what they term as relationship issues with their colleagues or supervisors, mismatch of skills and assigned duties and underutilisation of staff’s knowledge and skills and an increase in staff turnover. Some of the main reasons of seeking the service are job related issues ranging from pressure from work and personal issues.

The general objective of the study was to determine factors affecting staff service delivery at State Corporations, a case of Water Resources Management Authority, Nairobi County, Kenya. The study was guided by the specific objectives of: to determine how job description affects staff service delivery in state corporations, to examine how working relationships affect staff service delivery in state corporations, to determine how staff turnover affects staff service delivery in state corporations and to determine how staff motivation affects staff service delivery in state corporations.

II. LITERATURE REVIEW

2.1 Theoretical Review
2.1.1 Herzberg two Factor Theory

This theory was designed to better explain the factors that affected employee’s job attitudes and motivation. Herzberg performed studies including interviews, to determine which factors in employee’s work environment caused satisfaction or dissatisfaction. He found that factors causing job satisfaction (motivator factors) were different from those causing dissatisfaction (hygiene factors). Loiseau (2011) argues that there are two distinct human needs influencing employee’s motivation and attitude: Physiological needs that can be fulfilled by money for example to purchase food and shelter; and Psychological need to achieve and grow, only fulfilled by activities that cause one to grow.

Factors determining dissatisfaction include: company policy, supervision, relationship with boss, work condition, salary, and relationship with peers, all of which are external factors while those leading to satisfaction include achievement, recognition, work itself, responsibility, advancement and growth, which are intrinsic factors. Lawler (2011) examined the studies regarding the relationship between satisfaction and performance and found that satisfaction is an indicator of an employee’s motivation to come to work, satisfaction influences the motivation to perform a job effectively only very indirectly and that performance can influence satisfaction directly under certain conditions.

2.1.2 Maslow Hierarchy of Needs Theory

Maslow’s theory of human needs and motivation found that people fulfilled physical, security, social, esteem, and self-actualization needs in an orderly, ascending fashion. Depicted as a closed triangle, this model espoused that individuals may never satisfy all of their needs, especially needs at the highest level. Saleemi (2005) adds that Maslow’s theory comprises of five needs: Physiological need (most basic - air, water, sleep, food), safety needs (stability and consistency), love and need to belong (affiliate) needs, self-esteem needs (confidence/ respect) and Self-actualization needs.

Dennis, Newman and Marshland (2005) researched the relationship between consumer decision in shopping mall and hierarchy of needs. Valacich, Parmoteeh and Wells (2007) used Maslow’s hierarchy of needs to study the importance of web design elements and user experience, then constructed framework of online consumer's hierarchy of needs. Guo, Vasquez-Parraga, and Wang (2006) used Maslow’s hierarchy of needs to explain cross-border transactions of Mexico and the United State and found that the main motivation of Mexican consumers go to shop in United States are (1) product quality, (2) quality of service, (3) fashion and (4) fun.

2.1.3 Alderfer’s Hierarchy of Motivational Needs (ERG) Theory

The ERG theory was propounded by Clayton Alderfer in 1972 as a quick response to the lack of empirical evidence for the hierarchy of motives presented by Maslow in 1970. Notwithstanding, Alderfer’s version of the needs theory was built on the ideas of Maslow. ERG theory does not assume a rigid hierarchy where a lower need must be substantially satisfied before one can move on. Alderfer also deals with frustration. That is, if a higher-order need is frustrated, an individual then seeks to increase the satisfaction of a lower-order need.

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Lodhal (2015) argues that ERG theory is based on a three-fold conceptualization of human needs: existence, relatedness, and growth (E.R.G.). It does not assume lower-level satisfaction as a prerequisite for the emergence of higher-order needs. It does include propositions relating the impact of higher-order frustration to the strength of lower-order needs. Empirical tests of differential predictions among Maslow's theory, the simple frustration hypothesis, and E.R.G. theory were conducted by a questionnaire study with 110 employees at several job levels from a bank.

2.2 Conceptual Framework

![Conceptual Framework Diagram]

2.3 Empirical Review and Criticisms

2.3.1 Empirical Review

Jun et al. (2006) investigated the effects of TQM practice on employee job satisfaction. They found that employee empowerment, teamwork, and employee compensation had a significant and positive influence on employee job satisfaction, also the improved employee job satisfaction lead to a higher level of employees’ organizational loyalty. Another study that also used the concept of TQM practice is the study of Chang et al. (2010) that established that employee job satisfaction can be improved through the inclusion of TQM practices associated with human resources. These practices are employee empowerment, employee compensation, and team-work and management leadership. Beside the studies of the set of factors base on the TQM practices, other studies come up with the set of factors based on the related features of the job.

According to Ellickson and Logsdon (2011), there are various factors-related job satisfaction, for example pay, fringe benefits, equipment and resources, physical work space, safe working environment, career development opportunities, overall supervisor relation and departmental esprit de corps. In terms of employee job satisfaction, Parvin (2011) has mentioned four dimensions that have a profound impact on employee job satisfaction comprising salary, efficiency in work, fringe supervision, and co-worker relations.

Turkyilmaz et al. (2011) investigated various studies related to employee job satisfaction and identified main groups. These are: supervisor management; empowerment-participative management; salary, recognition, reward and promotion; teamwork and cooperation; training program, career development; working condition; communication; family-friendly policy; cooperate culture; compensation; job itself; organization as a whole; emotional exhaustion; performance management; recruitment; demographics; co-worker relations. Although different research brings out different sets, there are
still some main elements considered to be crucial factors that appeared on most of the researches. Those factors are believed to have greater impact on job satisfaction. They are: supervisor support, fringe benefits, teamwork, working environment and training. 

Supervisor supportive behaviour has been found to be related to employee job satisfaction (Griffin, Patterson & West, 2011). Fringe benefit is the material and non- material incentives the company offer to its employees to commit them to the company. In other words, fringe benefits are incentives that employees receive in addition to their wages and salaries during active job duty and in addition after retirement (OECD, 2007). Fringe benefit includes three main parts: obvious benefits, foregone labour benefits and hidden benefits (Hayes & Gaskell, 2007).

According to the result of Artz (2010), fringe benefits are significant and positive determinants of job satisfaction. Fringe benefit is also believed to have a profound impact on employee loyalty. It plays as a motivator factor that helps to improve employee performance and to reduce employee turnover (Kasper et al., 2012). It is suggested that teamwork is a collaborative and shared activity that is directed towards a common goal. Effective teamwork can motivate employees and improve employee performance and self- efficacy.

This increases motivation and self-efficacy through teamwork can be a source of employee autonomy, significance, bonding with team members and satisfaction (Griffin, Patterson & West, 2011). Working environment includes all the factors about the job such as all the facilities for doing the job, comfortable workplace and ventilation, safety workspace, and the degree of noise. These factors influence employee job satisfaction since employees want a working environment that provides more physical comfort (Ceylan, 2008). When this is provided by the firm, employee job satisfaction increases.

The relationship between working environment and job satisfaction had been proved by many researchers. It is shown that working environment is a critical factor in determining the level of employee job satisfaction (Chang et al., 2010; Jun et al., 2006). Employee training provides opportunities to employees widen their knowledge and abilities for more efficient teamwork and achieve individual development. Jun et al. (2006) asserts, when workers receive self- development training, the level of their job satisfaction is higher than those without such training.

When employees attend training programs, they gain self- confidence of making their jobs, they perceive career development opportunities and they think that their companies make investment in them (Jun et al., 2006). As result of this positive situations, employee job performance increases. Traditionally, employee loyalty meant the ability to stay with the organization in long term. It based on the premise that employee loyalty could be measure by the amount of time one work for the company or organization (Silvestro, 2012). However, as the economic is changing: downsizing, cooperate restructuring had made the definition of employee loyalty change.

Employee service delivery cannot be measured by the time they are working for the company alone, it need to include the amount of commitment employee makes when they are on the job (Phaneuf, 2013). According to Reichheld (2013), loyalty is the willingness of an employee invests in or sacrifices for the organization to strengthen a relationship (Reichheld, 2013). Thus, loyalty is characterized by the intention to engage with the organization in long term, which plays a positive role in retention of members in the organization. While job satisfaction mainly focuses on the attitude of employee toward his current job, employee loyalty explores a wider framework, which is employees’ attitude toward the organization (Chen, 2006).

According to Chang et al. (2010), employee job performance is an antecedent to employee loyalty. Some other studies such as Jun et al. (2006) and Arsi et al. (2012) also consistently report a strong relationship between organizational loyalty of employees and employee job satisfaction. Empirical evidence also suggests a positive relationship between employee job satisfaction and loyalty of employees (Fletcher and Williams, 2006). Employees who feel satisfied with their jobs will most likely be more loyal to organization than unsatisfied employees (Kim et al., 2005). Once the employee job satisfaction increased, the degree of organizational loyalty of employee also raised higher. On the other side, once the employee job satisfaction is decreased, it will lead to the decrease of employee loyalty, employee morale and the increase of job turnover. Low job satisfaction could also cause employees to recede from their jobs, seek new jobs, or change their current jobs and careers.

2.3.2 Criticisms to Empirical Review

The reviewed literature has not been able to address a number of areas and other factors that affect employee service delivery. For instance, whenever a group of people is put into a work situation, there’s potential for conflict which hamper overall service delivery. People bring to the job differing work habits, ethics, and modes of expression, and differences of opinion are bound to arise. It’s not possible to eliminate conflict from a workplace, but establishing clear guidelines for work responsibilities, promotion practices, and scheduling issues can go a long way toward creating a harmonious environment. Periodically reviewing employee responsibilities is necessary to make sure that one or a few employees don’t end up doing a disproportionate share of the work. If it turns out that some employees do less than their share on a consistent basis, you can bet the other employees recognize this and have some intense feelings about the situation.

Intervention is necessary; if the problem is lack of skills, make sure the poorly performing employee gets the training needed. If it’s an issue of poor time management or lack of organization, there are plenty of classes available in those skills; offer to pay for them and strongly urge the employee to attend. When personal conflicts do arise, have a policy for resolving them. Provide mediation and counselling opportunities for employees, and make sure they feel comfortable using them. If a conflict becomes serious enough to threaten the harmony and efficiency of the workplace, you may need to require mediation for the parties involved. Finally, keep an eye on the dynamics of different departments. Some may run very smoothly most of the time, while others seem to be in constant conflict. If that happens, you may need to take a good look at the management of the poorly functioning department; your department head may have a management style that invites conflict rather than serving to resolve it.
Workplace design needs to take into account of a wide range of other necessary factors that may be affecting service delivery. Creating better and higher performing workplace requires an awareness of how workplace impacts behaviour and how behaviour itself drives workplace performance and service delivery. Joroff et al. (2013) argues that in the relationship between work, the workplace and the tools of work, workplace becomes an integral part of work itself. Increasing workplace understanding is built on the recognition that space has different characteristics: it performs different functions and there are different ways people work. People work individually and interact with others and this requires different workplace solutions.

III. RESEARCH METHODOLOGY

The research employed a descriptive design comprising of both quantitative and qualitative data collection approaches. Descriptive research can be either quantitative or qualitative. It can involve collections of quantitative information that can be tabulated along a continuum in numerical form, such as scores on a test or the number of times a person chooses to use a certain feature of a multimedia program, or it can describe categories of information such as gender or patterns of interaction when using technology in a group situation. Descriptive research also involves gathering data that describe events and then organizes, tabulates, depicts, and describes the data collection (Glass & Hopkins, 2004).

The target population of the study comprised of 210 Management and staff members of WRMA Nairobi County, Kenya. The target population was distributed in four cadres which are; the Senior Management, Middle Level Management, Officers and Support Staff.

Table 3.1: Composition of Staff

<table>
<thead>
<tr>
<th>Target population</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior Managers</td>
<td>24</td>
</tr>
<tr>
<td>Middle managers</td>
<td>40</td>
</tr>
<tr>
<td>Officers</td>
<td>78</td>
</tr>
<tr>
<td>Support Staff</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>210</td>
</tr>
</tbody>
</table>

Source: WRMA

The researcher used Yamane formula to come up with representative sample. The Yamane formula is as follows:

\[ n = \frac{N}{1 + N(\epsilon)^2} \]

Where \( n \) is the size of the sample, \( N \) is the size of the study population while \( \epsilon \) is the deviation of the sample (error term).

Based on Ngechu (2004) argument, the researcher considers confidence level at 95% with 5% error term. Hence, using total population of 210 and error term of 5%, the sample size is as calculated below:

\[ n = \frac{210}{1 + 210(0.05)^2} = 138 \]

A representative sample size of 138 was used for this study because of the need to represent the target population in the study and the need to have a well spread representative group across strata. The sample also was enough to represent the salient features of the target population.

The study applied both probability and non-probability sampling procedures to obtain the number required for the study from WRMA in Nairobi County. The probability sampling which was used was stratified and simple random sampling. From each stratum, simple random sampling was then applied to arrive at 138 out of 210.

Further, across each stratum, the respondents were distributed as shown in table 3.2:

Table 3.2: Sample Size

<table>
<thead>
<tr>
<th>Study population</th>
<th>Size</th>
<th>Sample size Ratio=138/210</th>
<th>Actual Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior Managers</td>
<td>24</td>
<td>0.657</td>
<td>16</td>
</tr>
<tr>
<td>Middle managers</td>
<td>40</td>
<td>0.657</td>
<td>26</td>
</tr>
<tr>
<td>Junior Officers</td>
<td>78</td>
<td>0.657</td>
<td>51</td>
</tr>
<tr>
<td>Support Staff</td>
<td>68</td>
<td>0.657</td>
<td>45</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>210</strong></td>
<td><strong>0.657</strong></td>
<td><strong>138</strong></td>
</tr>
</tbody>
</table>

Both stratified and simple random sampling techniques were used in the study. In selection for sampling techniques, this study was concerned with the principle that the sample had to reflect the population. This technique was used to ensure that the target population is divided into different homogenous strata and each stratum was represented in the sample in a proportion equivalent to its size in the population. From each stratum, simple random sampling was then applied to arrive at 138 out of 210. Simple random sampling was used to ensure that each member of the target population was an equal chance of being included in the sample.

Questionnaires consisting of structured and non-structured questions were used to collect data from the top management; middle level management, officers and support staff of Water Resources Management Authority. The structured questions were used to collect quantitative and qualitative data by analyzing the following variables: Job description, working relationships, staff turnover and staff motivation. The researcher asked for permission to carry out the research from the General Manager, Water Resources Management Authority, Nairobi County, Kenya.

Primary data for the study was collected by way of self-administered questionnaires. The questionnaire had two sections: the first section was to seek demographic data of the respondent while the other section focused on the link between job description, working relationships, staff turnover, staff motivation and service delivery. For the lower cadre staff, the researcher administered the questionnaires in person in order to guide the respondents on what would be required of them.

In order to test validity of data collection instruments, the researcher sampled questionnaires, picked 14 respondents of the target population before the actual research period for a sample study. This helped the researcher to attest how reliable the data collected by the questionnaires would be. To ensure consistency in the data resulting from this study, measures such as isolating...
respondents to ensure that answers to specific questions are not discussed were employed during data collection to limit interference with the integrity of the results. In this study, reliability of the data was ascertained by pre-testing the questionnaire with a selected sample of employees from WRMA to avert biasness.

The initial phase of analysis involved coding of the raw data into an orderly sequence of information in the form of tables. Content analysis was performed on the data to allow for in-depth understanding of the issues in the case. Nachmias and Nachmias (2006) noted that content analysis is a technique for making inferences by systematically and objectively identifying specified characteristics of messages and using the same approach to relate to trends. The data obtained after performing content analysis was cleaned and interpreted to form useful information. In this study, data was analysed using mean, frequencies and standard deviation.

According to Miller (2011), descriptive statistics is used to describe collected data. In this study, the objective data categorization methodologies were used to isolate and highlight relevant trends. Averages, dispersion frequencies and percentages accurately served this purpose. There was further processing for presentation of results in a variety of tables, graphs and charts using Ms Excel. Conclusions were then drawn from the findings and recommendations made.

IV. SUMMARY OF FINDINGS, POLICY RECOMMENDATIONS AND AREAS FOR FURTHER RESEARCH

4.1 Summary of Findings

4.1.1 Gender Category

A total number of 45 female and 93 male water resource management authority staff of Nairobi County was sampled. This represents a gender sample percentage of 32.6% and 67.4% respectfully. The third gender rule was factored and therefore the sample is thus sufficient as the views of both sexes are captured in the research.

4.1.2 Age Category

The study established that the water resource management authority employs officers of the age of 18 years and above. The finding shows that WRMA has more officers in the 46-60 years age bracket (39.9%) while 23.2% are in the age bracket of 18-30 an indicator that few youthful staff has been employed in the recent past.

4.1.3 Management Level

The study requested the respondent to indicate their management level in the organization. From the study findings, majority of the respondents as shown by 37.0% percent were in the junior officer management level, 32.6 percent were support staff management level, 18.8 percent of the respondents were middle level managers. These findings depict that all the management levels in the water resource management authority were captured in this study.

4.1.4 Length of Service

The respondents were requested to state the years they had worked with WRMA. The results showed that most officers had worked for 10 years (29.2%) and 6.6% had worked for four years. On average the staff had worked for 8 years this is an indicator that WRMA has been doing minimal recruitment of the staff which can be attributed to low staff turnover

4.1.5 Regression Analysis

This section presents a discussion of the results of inferential statistics. The researcher conducted a multiple regression analysis so as to investigate the factors affecting service delivery in state corporations in Kenya: a case study of Water Resource Management Authority. The researcher applied the statistical package SPSS version 21 to code, enter and compute the measurements of the multiple regressions for the study. Findings are presented in the following tables

Table 4.1: Results of regression of service delivery (SD) and its determinants

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>Coefficients</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Constant)</td>
<td>48.857</td>
<td>0</td>
</tr>
<tr>
<td>Job description(JD)</td>
<td>0.236</td>
<td>0.022</td>
</tr>
<tr>
<td>Working relationship (WR)</td>
<td>-0.084</td>
<td>0.517</td>
</tr>
<tr>
<td>Staff turnover (ST)</td>
<td>-0.504</td>
<td>0.0</td>
</tr>
<tr>
<td>Staff motivation (SM)</td>
<td>0.673</td>
<td>0</td>
</tr>
</tbody>
</table>

R² = 0.372 Adjusted R² = 0.353

The estimated equation is SD = 48.857 + 0.236JD -0.084 WR-0.504ST+0.673Sm

4.1.6 Factors affecting staff service delivery at State Corporations

The main objective of the study was to determine factors affecting staff service delivery at state corporations. The research found out that job description, staff motivation, Staff turnover and working relationship affect service delivery. Considering the service delivery and independent variables, table 3 indicates that 35.3% of variation in service delivery is explained by job description, staff motivation, Staff turnover and working relationship.

Job description was found to have a positive coefficient which shows that it was directly proportional to service delivery. This means that an increase in any of job description led to better service delivery. It also means that a decrease of job description led to poor service delivery. The study found out that working relationship had a negative coefficient, which means that any decrease in working relationship, led to increase in service delivery and an increase in working relationship led to a decrease in service delivery.

It was established that staff turnover had a negative coefficient, which means that any decrease in staff turnover led to increase in service delivery. It also means that an increase of staff turnover would lead to a decrease in service delivery. The study found out that staff motivation had a positive coefficient which shows that it was directly proportional to service delivery. This means that an increase in staff motivation led to better service delivery. It also means that a decrease in staff motivation would lead to poor service delivery.

4.2 Recommendations

It is recommended that capacity building on service delivery be done to organizations especially to state corporations

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in Kenya both existing and upcoming. This is because service delivery is an integral part of any organization and this will help in ensuring overall performance of the organizations. It is also recommended that WRMA should enrich job descriptions to its members of staff in order to improve service delivery.

WRMA should find a way of reducing working relationships in the organization in order to achieve better results. WRMA should work towards reducing the level of staff turnover in order to increase service delivery. Further, WRMA should implement the outcome of this study by increasing staff motivation in order to improve service delivery.

4.3 Areas for Further Studies

The same research could be done but data be collected from different sources. This could include various state corporations in Kenya so as to enable better generalization of the results. Another research study could also be carried out to determine other factors that affect service delivery in state corporations in Kenya other than those covered in this study.

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The Impact of the Inclusion of Secession Clause in the Federal Democratic Republic of Ethiopian Constitution on the Prospect of Ethiopian Federation

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Abstract: The ultimate purpose of any constitution in either granting or denying constitutional secession right should be maintaining the unity and territorial integrity of the state. Granting constitutional secession right will have both benefit as well as a cost. To reap the benefit, constitutional secession rights should be designed wisely and skillfully in a manner they can prevent secession and maintain the unity and integrity of the state. The Federal Democratic Republic of Ethiopian constitution is among very few constitutions in the world that included secession right in their constitution. This article vehemently claims that carefully designed secession right in constitution can help to effectively prevent secession and disintegration of a multi-national state. However, the secession right as it appears in the current Federal Democratic Republic of Ethiopian constitution cannot prevent secession, if the right is going to be operationalized. The clause in the constitution lacks the capacity of making secession difficult. Similarly, repealing the secession right out of the Federal Democratic Republic of Ethiopian constitution without bloodshed seems very difficult. Hence, the only option is revisiting and amending the clause and the procedures of secession in which it can wisely and effectively sabotage and prevent secession and disintegration while maintaining the unity and territorial integrity of the Ethiopian state.

Key Words; Secession, constitution, Ethiopia, Impact

1. Introduction

To handle diversity and maintain the territorial integrity of the country, Ethiopian regimes of 20th century have used different approaches. By earlier regimes, centralization and creating one national identity for multi-national and multi-religious country of Ethiopia was inaptly pursued by different monarchic regimes. Later on, the Dergue regime that assumed political power in 1974 through popular revolution pursued its own strategy of handling diversity under the framework of its ‘socialist’ ideology. In both earlier systems, let alone granting constitutional secession rights, taking secession as an option was more often than not treated as a taboo by the ruling elite.

The incumbent regime, however, has been attempting to maintain the integrity of Ethiopian state on the basis of multi ethnic federalism, which anomalously extended the right of “nations, nationalities and people’s” of the country up to secession.1 As a

result, the Federal Democratic Republic of Ethiopia (FDRE) constitution has granted secession right in a clause that talks and enumerates the procedure of secession.

Review of available literature on the topic under enquiry reveals the presence of plenty of scholarly work on the issue. However, literature on the secession right of the FDRE constitution are more often than not politically motivated and biased towards the political outlook of the respective writers. The existing literature on the secession right of the FDRE constitution argues either to drop the sub-articles as a whole or to take it as it currently appears in the constitution. These extremely opposite assumptions have not yet considered other options which are important to preserve the unity of Ethiopian state. By taking in to consideration the aforementioned gap on the existing literature, this article attempts to critically analyze and evaluate the impact of the inclusion of the secession clause in the Federal Democratic Republic of Ethiopian (FDRE) constitution on the future fate of Ethiopian federation.

The author argues, carefully designed secession right in constitution can be used effectively to prevent secession and disintegration of a multi-national state. But the secession clause of FDRE constitution lacks a lot to do so. Hence, the article needs little modification on its procedures, in which the secession right of the constitution could serve to effectively and wisely sabotage and prevent secession.

As a source of data, this work used review of the existing academic literature and government documents. The article is organized in to five sub-sections. The first sub-section deals with introductory and some methodological issues. In its second sub-section the article sheds light on conceptual and theoretical roots by which the rationale behind including and excluding secession rights in a constitution could be critical evaluated. Then in its third sub-section, the article assesses the secession clause of FDRE constitution. In its fourth sub-section as its major concern the work emphasizes and briefly analyze the impact of secession clause of FDRE constitution on the future fate of the country. Finally, concluding remark is briefly forwarded.

2. Conceptual and Theoretical Framework

Secession is the act of formally withdrawing from a political entity or union and establishing new independent state. On the other side of the coin, secession also refers severance of central governments control over a territory. Currently secessionist movements are increasing in number and referendums on the issue are becoming frequent in the world. However, there is no clear provision explicitly explaining secession and the way it can be undertaken under international law. Vienna Convention of 1978 which deals with state succession bypassed the issue of secession. As a result, there is controversy both over the existence of a secession right, and over the mechanisms by which it might be operationalized.

Different literatures reveal that constitutional secession rights are rare in the world. It is believed that the objective of all constitutions in giving or denying secession right should be to maintain the territorial integrity and unity of their respective states. Accordingly, some constitutions declare their states to be indivisible and explicitly prohibit secession to safeguard their territorial integrity. On the other hand, very few numbers of constitutions contain explicit secession clauses such as the 1983 Constitution of St Kitts and Nevis and the 1994 FDRE Constitution.

Broadly, as Buchanan in his work “Theories of Secession” elaborated, secession can be divided in to two major categories; constitutional secession and consensual secession. Constitutional secession is secession with constitutional backing. Here the constitution may specify the procedures and the way secession could be implemented. On the other hand consensual secession is a

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negotiated secession; this happens when the constitution does not say anything about secession. This typology of secession does not consider secession as of a right or as a best alternative of managing diversity rather it considers secession as a last resort. From this it can be deduced that the occurrence of secession is always a possibility and independent of constitutional right. It can occur whether the constitution grants it as a right or not.

There are two broad theories of secession: the choice theory and remedial theory. Dealing in detail about the theories of secession will be beyond the scope of this article. To see briefly, however, choice theory asserts that certain groups can have a general right to secede even in the absence of any injustice. Choice theory does not limit legitimate secession to a means ofremedying injustice. On the other hand, remedial theory asserts that a group has a general right to secede if and only if it has suffered certain injustices for which secession is the appropriate remedy as a last resort. This theory places significant constraints on the right to secede.

3. **Secession in the FDRE constitution**

Many agree that in the world out of currently existing constitutions, it is the Ethiopian constitution which is exceptional by allowing the right to secede for all “nations and nationalities and people’s” of the country. The country has constitutionally expressed the right of secession along with concrete procedural rules on how to secede. This has its grounds within the ethnic based political arrangement which the incumbent regime has adopted since 1991.

Many argue that the current regime’s ethnic based political arrangement has stem out of Marxist-Leninist ideology and its conception of “national question”. This concept was introduced to Ethiopia in mid-1960 by the Ethiopian Student Movement. But beginning from that time the right of self-determination up to secession became the organizing principle and raison d’etre of ethno nationalist organizations that later on formed the government of the Federal Democratic Republic of Ethiopia (FDRE).

Article 39 (1) of the 1994 FDRE constitution clearly stated that “Every nation, nationality and people in Ethiopia has an unconditional right to self-determination, including the right to secession”. The constitution in explaining the procedures for secession has further stated that

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... secession of every nation nationality and people in Ethiopia is governed by the following procedure: (a) When a demand for secession has been approved by a two-third majority of the member of the legislative council of any nation, nationality or people; (b).... (C) When the demand for secession is supported by a majority vote in the referendum...10
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Critical glance at the procedures of secession in FDRE constitution reveals that the requirements for secession are simple and easily achievable. Unlike other few similar constitutions, in the Ethiopian constitution secession requires only simple majority vote of the people. When the constitution of other few countries is considered, however, more often than not two-third majority vote of the people is a requirement for secession to take place. In which secession was attempted and failed because of this relatively strong criteria set by their constitution. By putting strong criteria, as it is elaborated below the constitution of Saint Kitts and Navis was used as a choking mechanism which successfully prevented secession and disintegration of the state.11

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10 The Federal Democratic Republic of Ethiopian Constitution, 1994

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By considering the easily achievable criteria set by the constitution, the author argue that the secession clause of article 39 of FDRE constitution has no capacity to minimize the chance of secession, if the right is going to be operationalized.

4. The Impact of the Inclusion of the Secession Clause in FDRE constitution on the Future Fate of Ethiopian Federation

The secession clause of FDRE constitution is probably the most controversial provision of the constitution. That is why there is no agreement among scholars, politicians as well as the wider public on the significance as well as the impact of this constitutional secession right. Some scholars and politicians emphasizes on the little claimed benefit of the right, while others thoughtlessly opposed the secession right and called for repealing the sub articles as a whole.12

But this short article argues that the inclusion of the secession right in a given constitution, depending up on the manner it was designed, will have its own pros and cons. However, if it is not carefully stated and skillfully designed to prevent the possible secession attempt its disadvantage over weights and will pose danger for the unity and territorial integrity of the state.

In Ethiopian context repealing the secession right out of the constitution is difficult if not impossible. Because this may aggrieve some ethno-nationalist political entities with secessionist aspiration which may in turn lead to undesirable bloodshed.

So since the unity of the state should not be cemented by the bloodshed, the only option is to modify the procedures of secession put on the FDRE constitution of Article 39. Unless this little amendment with huge significance is not made the secession right granted to all nations and nationalities of the country as it appears in the FDRE constitution cannot prevent secession. It seems that the problem it posed and the danger of disintegration is looming a head and waiting time to erupt once again to cost the country the invaluable.

4.1 The Pros of the Secession Right in the FDRE Constitution

The only advantage of specifying secession right in a multi-national state’s constitution is to wisely sabotage and prevent secession and disintegration of the state. That can be only done by providing a number of procedural hurdles that secessionists would have to meet in order to secede. By doing so Secession can be made more costly and bring the chance of disintegration close to zero. This helps to democratically reduce the chance of ethnic based violence and successfully prevent secession and maintain territorial integrity of a state. In such occasion the existence of secession right in the constitution is important to sabotage the secession process itself and will contribute to maintain the unity and territorial integrity of the state.13

For instance, as Kreptul in his work (2004) elaborated, in 1998 the other only state that specified secession right in its constitution, St Kitts and Nevis conducted referendum for the separation of two tiny islands. In which majority but less than two-third Nevis voted for secession. So had St Kitts and Nevis constitution put simple majority vote of the people as a requirement to effect secession, Nevis would have been seceded from St Kitts. Here it can be easily understood that the requirements set for secession in the constitution are important and should not be underestimated.

The proponents of including secession right in Ethiopian constitution argues that effective exit rights in the constitution underscore the voluntary nature of the federal system and protect minorities which can safeguard the territorial integrity of Ethiopian state. But the reality seems slightly different. Because the constitution’s secession right set weak and easily attainable requirements. The problem arises when the right is going to be operationalized. So the impact of the inclusion of the secession right in such a way may cause disintegration of the state.

4.2 The Cons of the Inclusion of the Secession Clause in the FDRE Constitution for the Future Fate of Ethiopian State.


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Historical experience suggests that secessionist politics tends to be a bloody and miserable business. That is why some scholars argued that whether secession might be justified or not, constitutions should not include a right to secession. Putting such rights in the constitution will increase the risk of ethnic struggle and creates dangers of blackmail.  

In Ethiopian context, the author argues, the secession right granted by the 1995 FDRE constitution has recklessly put simple and easily achievable requirement. By considering this, critics of the constitution argued that it is an invitation for disintegration of ancient and un-colonized African state. The right to secession should not be treated neither as the best alternative of accommodating diversity nor an indication of a working federation or democracy. Accommodating diversity may not necessarily require the granting of an unconditional right of secession. Because many countries are successful in accommodating the interests of minority nationalities without constitutionally putting the road map of secession and allowing them to secede. But, convincingly many argue that the current Ethiopian government’s emphasis on secession right and considering it as one pillar of the state policy will defeat the federal principle itself.

On the other hand, though it’s aimed to appease ethno-nationalist groups, it seems the right has not satisfied the ethno-nationalists within Ethiopian state. Plethora of organized ethno-nationalist political entities supports the constitution’s secession clause. However, they claim that it is not yet operationalized. In contrary, the ‘pan-ethiopians’, by considering the constitutional secession right as a threat to territorial integrity and unity of Ethiopian state, they strongly oppose the constitutionally granting secession right. From this it can be understood that the secession right of the FDRE constitution is not able to escape criticism from both those who allege to drop the secession clause out of the constitution as well as ethno-nationalists that are waiting for the operationalization of this constitutionally granted right to secede.

5. The Way Forward

As it has been discussed so far, depending up on the way it is devised granting constitutional secession right will have two different consequences; one will be benefit and the other will be invaluable cost. This article found that, to effectively use the benefit of including the secession clause to maintain the unity and territorial integrity of the Ethiopian state, the constitutionally granted secession right needs amendments. Modifying the article’s procedures of secession helps to wisely prevent secession and can bring the chance of disintegration of the state close to zero.

The first minor amendment should modify the requirements of secession. That means, the simple majority vote of the people should be changed to two-third majority vote of the people as a requirement of secession. In addition to this, it is still possible to further strengthen the secession right and use in favor of national unity by making secession impossible, costly and unachievable for the seceding unit. That is, the constitution should clearly specify secession to recursively use the majority vote principle separately over all sub units of the territory claimed by a separatist. For instance, if the majority of “North” of a state votes for secession, the vote of sub-units should be considered and respected. That means, if the majority of “North West” of “North” votes not to secede, the seceding unit should not be allowed to take this part of its territory into independence.

This article further argues elaborating further the procedure of secession in the FDRE constitution incorporating the above two issues may help the secession right to prevent the unity and territorial integrity of the Ethiopian state.

15 ibid
Conclusion

The secession clause of FDRE constitution is the most controversial provision of the constitution. Some argued in support of it while others opposed it and are repeatedly calling to totally repeal the article out of the constitution.

The author, however, argues that the secession right as it appears in the current Federal Democratic Republic of Ethiopian (FDRE) constitution cannot prevent secession, if the right is going to be operationalized. The clause in the constitution lacks the capacity of making secession difficult. Similarly, repealing the secession right out of the constitution without bloodshed is very difficult. So the only option is amending the clause in which it can prevent secession and disintegration of the Ethiopian state. Hence, the constitutional architects who designed such constitution for Ethiopia should revisit the constitution and make important but little amendment on the procedures of secession. Unless this amendment is not skillfully done, the extension of the right of self-determination up to secession in the FDRE constitution poses more problem on the future fate of Ethiopian state than it solves.

References

IMPACT OF E-COMMERCE INNOVATIONS AND STRATEGIES AS COMPETITIVE BUSINESS MODELS IN KENYAN SMES

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ABSTRACT: This study identifies and examines factors affecting customer loyalty in e-retail environment. This research examines e-commerce and identifies convenient shopping experience as a strategy that can be used to improve service offering to attract and retain customers. Thus, it is useful for businesses to understand the differences between e-commerce and traditional methods of business to enable them identify the new internet-based opportunities that might better satisfy the unique needs and desires of their customers. A qualitative research design was used. Primary data being the main source of data for this study was gathered by use of questionnaires and interviews. The researcher collected data through questionnaires to examine how e-retailing improves customers shopping experience. The researchers administered one hundred and fifty questionnaires (150) through hand delivery and web-based methods. The group of respondents comprised of working class people, credit card holders and students from who live within and on the outskirts of Nairobi. These respondents were randomly selected and contacted. Out of the one hundred and fifty people contacted, seventy (70) respondents returned completed questionnaires. This represents 47% response rate from the questionnaire. Purposive sampling was used to obtain the sample frame. Data was analyzed by SPSS and presented by tables and charts. The study established that the SME sector was characterized by young owners/managers (with majority being less than 45 years) mostly male, with at least high school/technical education. The sector was also characterized by firms with significant levels of ICT capacity, which increased with firm size. The major environmental factors of the MSME sector in the context of e-commerce adoption were that a greater proportion of the small and medium enterprises experienced the effect of customer pressure, competitive intensity, and supplier pressure. The analysis of technological and organizational factors indicated that e-commerce was associated with better relative advantage, innovation complexity, trainability, compatibility, observe-ability, and security/confidentiality. The level of significance of the factors for innovation adoption increased with increasing firm size. The study also found that e-commerce adoption was significantly affected by supplier pressure, sector of business operation, market focus, competition intensity, and customer pressure. The results showed integrating the business profile with technological and environmental factors resulted in no change to the direction of the influence of position in the firm, age, and gender variables on e-commerce adoption. Regarding the effect of interaction of the technological factors, the results showed that there was no change in the direction of the influence of perceived relative advantage, complexity, and security/confidentiality, but the direction of influence of trainability, observe-ability, and compatibility changed from direct to inverse. Finally, the findings revealed that, due to interaction of the variables, there was no change in the direction of the effect of supplier pressure, sector of business operation, competition intensity, and customer pressure.

Keywords: E-Commerce, Online Merchants, Online Transactions, ICT

1. INTRODUCTION

The internet provides new ways for customers to shop for their needs. Internet technology is available almost everywhere worldwide and using the internet for information is already the number one reason customers' state for being online. Internet technology allows products and services to be offered on a scale never possible before: a potential global market with a variety of choices that is simply not possible with limited physical floor space (Cunningham, 2000). E-retailers can now serve their customers twenty-four hours a day with variety of products and services at reduced price (Walsh & Godfrey, 2000). Though there are potential business benefits arising from the usage of Internet, successful e-retailing still face numerous challenges such as: improved customer service, increased competition and increased cost of website and content management.

While these remain an important managerial challenge, there is also a changing wave of customers growing expectation for continuous improved products and service offering. Retail businesses should therefore take advantage of internet opportunities and
build enduring customer-retailer relationship for a sustained customer loyalty. More personalized service that satisfies customers need can be developed and deployed into e-commerce environment (Windham & Orton, 2000).

Research and development in the information and communications technologies (ICT) sector is consistently making new headways and developing new products that render previous ones obsolete, and trying to keep up with the ever-changing environment is an increasing concern of developing countries. There is now sufficient and growing evidence that enterprises gain substantially from e-business. Fast productivity growth in industrialized countries has been largely attributed to the widespread application of ICT, creating millions of new jobs and billions of dollars in savings.

The advancement of the internet and the consequent development of electronic commerce have resulted in a dynamic operating environment where business transactions are conducted over the internet. Internet transactions are a critical element of e-commerce as business transactions such as buying and selling of products and services and communication are conducted over the internet (Janita & Chong, 2013). According to Lawrence & Tar (2010), internet transactions provide great opportunities for businesses in terms of gaining access to markets across the globe and a driver of the economy a developing country such as Kenya. The adoption of internet transactions has significantly supported the growth of businesses and holds a promise in the reduction of costs and improvements in the operational efficiency.

Due to internet transactions, relationships between the business and its customers have become closer. Electronic commerce has significantly increased interactivity within the economy and this extends even to small firms that hope to reach out to the entire world. Online transactions have increased the ability of people to communicate as well as to carry out business in virtually any location and at any time and this has eroded the geographic as well as economic boundaries.

According to UNCTAD (2016), e-commerce readiness varies by region. Just over a fifth of the population in Africa uses the Internet compared to two thirds in Western Asia. While Western Asia and transition economies fare well on most indicators, credit card availability is average. Overall, Asia needs to boost Internet penetration, which currently stands at just over a third of the population, as well as the number of secure servers. In Latin America and the Caribbean, the main barriers appear to be low credit card penetration and relatively poor postal reliability. Africa ranks the lowest in all the indicators. Unless there is improvement in the underlying transaction and logistics processes, African online shopping is likely to remain confined to wealthier populations in urban areas.

In Kenya however, the situation is steadily improving. Over time and with the increased penetration of the mobile ecosystem, a new subset of e-commerce has come up. M-Commerce, which stands for Mobile Commerce, refers to the commercial transactions being conducted over cellular and mobile devices. M-commerce has created new opportunities such as the ability to purchase physical goods in a mobile online store or through mobile applications that interact closely with the physical store’s point-of-sale system. This is an advantageous mechanism for commerce as it bypasses the checkout process, which includes queuing, and physically waiting to order and purchase goods.

Mobile Payments also known as mobile money, generally refer to payment services that are operated under financial regulation and performed from or via a mobile device (Ignacio & Radcliffe, 2010). These mobile payments can be integrated into the e-commerce and m-commerce platforms to provide a convenient mechanism to pay for the good and services on the online platforms. The combination of widespread cellular communication and the ability to transfer money instantly, securely, and inexpensively are together leading to enormous changes in the organization of economic activities countrywide.

According to the Communications Authority of Kenya, the Kenya’s e-commerce market was worth around Ksh.4.3 billion in 2014. But with internet penetration of 82.6% and 35.5 million users, Kenya is one of the African countries best placed for a digital commerce explosion. Ksh.3billion in mobile transactions already takes place in the country each day, according to statistics from the Communications Authority. Most digital transactions in Kenya will take place via smartphones and mobile broadband because of low fixed-line and PC penetration. However, the mobile experience has improved dramatically in recent years and it has become simple and enjoyable to shop from a smartphone. With mobile money providers like M-PESA now adding APIs for smartphones to their products, they are opening up a range of new m-commerce applications and services.

This is particularly significant given the low penetration of credit and debit cards in Kenya – a factor that has inhibited e-commerce. Kenyans excluded from the formal banking system have lacked safe, easy and convenient ways to pay and be paid. According to the Financial Access National Survey of 2006, 38% of people didn’t use any form of financial service; formal, semi-formal or informal prior to the launch of M-PESA while only 19% of the population had access to formal financial services. Another significant factor is the Communications Authority of Kenya’s commitment to creating a robust national address system in the short to medium term. Up until now, the lack of an efficient address system has made it difficult for couriers to deliver goods bought online to their customers’ hands.

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With growing competition and increased level of customer demand for quality products and services, the internet and internet related activities has become an important field of study for both researchers and practitioners. A study of e-commerce literature is conducted and used to develop framework that describes customer loyalty as an important element of successful e-retailing. One of the challenges for retailers is to understand the new technologies and to ascertain how to use them to ensure customer loyalty. For e-retailers to survive in this new environment, the internet, a constant improved e-retail approach will be required to improve quality of customer service. Improved customer service creates a foundation for customers' loyalty that leads to repeat patronage. This study identifies and examines factors affecting customer loyalty in e-retail environment. This research examines e-commerce and identifies convenient shopping experience as a strategy that can be used to improve service offering to attract and retain customers. Thus, it is useful for businesses to understand the differences between e-commerce and traditional methods of business to enable them identify the new internet-based opportunities that might better satisfy the unique needs and desires of their customers.

2. LITERATURE REVIEW

2.1 E-Retailing and Customer Loyalty
In e-retailing, because a company website represents the brand and stands as a substitute for the traditional shop, customer loyalty depends, even in the first instance, on the website's performance. Judgement about performance will be based on its usefulness and more specifically on its impact on service quality, during and after purchase. The interrelationships among loyalty, trust, and relationship have been well established in marketing and service management literature (Berry, 1995; Berry and Parasuraman, 1991; Foster and Cadogan, 2000; Graham, 1999; Kandampully, 1997).

Customer loyalty is essential for all businesses, especially for e-commerce ventures that seek to strengthen their brand image. Building customer loyalty is vital to the success of the e-retailer because, without loyal customers, even the most effective business model will fail, and the business will eventually try to satisfy the whims of only price-sensitive customers (Reichheld & Schefter, 2000).

Reichheld and Schefter (2000) further explain that attracting and retaining a larger number of customers requires e-commerce businesses to remain devotedly customer centric, as e-customers continue to demand more from their internet experiences and have many more opportunities to migrate to other sources of supply, based upon easily available price comparison information. Competitive pressures of new electronic markets in improving customer loyalty, and meeting up with customers' demand would force businesses to join the market, irrespective of their willingness to do so. The question is no longer whether to deploy the internet, but how to deploy it profitably. However, the disastrous experiences of new internet-based businesses in the "dot-com" period have proven that the pressures to join in are no guarantee of success (Porter, 2001).

In recent years, an increasing number of e-commerce businesses have specialized in selling service products such as airline seats and hotel room nights. As service intermediaries, these businesses have successfully gained the interest and patronage of customers because they are able to offer substantial benefits to the customers through e-retailing, such as product choices, convenience, and value for money (Foster & Cadogan, 2000).

To maintain this relationship, the e-commerce business continues to find ways to build the customer's commitment and loyalty. For example, when Amazon planned to introduce their music store they asked customers to help create it. They asked customers to provide reviews on a number of CDs and videos. When Amazon.com finally opened the doors of its music store, they already had a potentially loyal customer base. This was a store created by customers for them; it was natural that they would start shopping there. Customers, who recognize that an offering is targeted at them, or when they have a hand in its creation, are more likely to return (Walsh & Godfrey, 2000). The explosive growth of usage of the internet provides a great number of potential customers to e-commerce businesses.

When an e-commerce business deploys its website as a source of information and service interaction for its customers, research indicates that it will discover that customers will tell them exactly what they want and need with great precision. Such businesses will probably learn, to their dismay, that in order to satisfy their customers need they will have to do major work on their existing systems. In the long run, customers will prefer to do business with companies that put the customer's needs first.

2.2 The Emergence of E-Commerce
Some years earlier, Rayport and Sviokla (1994) had noted that business transactions were already occurring in both traditional and web-based channels. These authors were writing at a time when the internet was barely known and were already thinking about the consequences. In technology-based business channels transactions occur "on screen" in an electronic environment, rather than as physical interactions "over the counter".  

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E-commerce impacts directly on marketing, as the record of published work shows - some of the earliest experience with e-commerce revealed that not everyone will be interested. Berry (1995) reported that in moving to e-commerce, businesses must first identify the potential customers interested in working with that technology. Although technically a company website in principle has the capacity to serve an unlimited number of users, not everyone will be attracted. Strategically, it is important to identify the specific market segment that the website will attract and can be directed to serve its customers. In this pattern of evolving experience, it becomes clear that the emergence of e-commerce dramatically raises the significance of competition between businesses, and forces businesses to adapt continuously to new market situations (Mellahi & Johnson, 2000).

The growth of e-commerce has attracted considerable recent attention within all business spheres. Increasingly, traditional retail businesses have also begun to utilize the opportunities offered by trading activities through the Internet. As different regions of the world take e-commerce in different ways and at different rates, it is interesting to contemplate how quickly the United States (US) population has adopted the Internet and it is easy to understand why. Historically, the US has been a country in which new technologies are assimilated fairly rapidly, given the relative lack of economic constraints and the manufacturing realities of the time (Burt & Sparks, 2003).

Windham and Orton (2000) further explains that the US is the source of most internet technologies and it is not surprising that it should be in the lead in their application. The internet reached as many Americans in the first six years as telephones did in four decades. Everyday internet access is becoming available to a growing percentage of the US population (Windham & Orton, 2000). These authors argue that of all the wealthier economies in the USA, Asia and Europe, more than half the combined population has internet access and it is inevitable that more consumers will choose to make purchases through the internet as access becomes more widespread.

The increasing importance of e-commerce was apparent in a large study conducted by researchers at the Georgia Institute of Technology (Provost, 2000). It was found that electronic commerce was taking off both in terms of the number of users shopping as well as the total amount people were spending via internet based transactions. Provost (2000) also found that through the connectivity provided by the internet, the range of goods and services offered can be extended. It is feasible for retailers to sell millions of products via their websites as the technology brings buyers and sellers together regardless of their geographical location. Clearly, electronic commerce brings new forms of market to e-customers and e-retailers, partly out of new ways to do business, but originally because of the technologies that are now in use.

2.3 Extent of E-Commerce Adoption

Despite the perceived business value of ecommerce adoption, e-commerce is not as widespread as it should. According to the Communication Authority of Kenya (CAK), e-commerce remains relatively low in Kenya despite good internet connectivity and high uptake of mobile payment services. The CAK identified some factors that is says stifle uptake of e-commerce, namely: high custom duty and taxes paid on imports, inadequate cyber security systems to allow merchants verify the identity of their customers and manage potential fraudulent usage and a lack of reliable, low-cost delivery services and system to enable consumers return unwanted or defective items. The CAK estimates the value of e-commerce in Kenya at KSh4.3 billion compared to South Africa’s KSh54 billion while in Egypt and Morocco it is about KSh17 billion and KSh9.6 billion respectively.

The total duty and tax paid for incoming items amounts to almost 50% of the value of an item. These are some of the areas that need to be addressed to increase the uptake of e-commerce in the country. The authority through the Information Communications and Technology (ICT) ministry will be engaging the government on customs and taxes for low valued e-commerce items, with a view of lowering the duties and taxes currently charged. Looking at the improved internet connectivity, this resulted in an increase of the number of users to 22.3 million in 2014. The increased numbers and preference by the youths to access information on their mobile phones has opened a window for investors in the retail industry, newspaper and book publishers as well as in the hospitality industry such as fast food outlets to leverage on technology to drive increased sales and customer loyalty.

Improved marketing is perceived to be the most important business value of e-commerce followed by better customer service and improved communication respectively. The other perceived benefits are new business opportunities, cost reduction and efficiency. More recent research suggests that SMEs have been relatively slow to adopt e-commerce. Consequently, large firms are most dominant and more pervasive than small and medium sized firms as far as e-commerce is concerned (Daniel & Grimshaw, 2002). Also, there is limited usage of internet technologies by medium sized firms (Arnott & Bridgewater, 2002). The authors tested the level by which small and medium enterprises are using the internet and they found that the majority of the firms were using the internet for information provision rather than interactive, relation-building or transactional facilities. They also found that smaller firms were using significantly fewer internet tools than their larger counterparts.

The organizational context can motivate or inhibit the adoption of e-commerce. The perception of management towards the benefits of e-commerce is an overriding factor in its adoption (MacGregor, Waugh, & Bunker, 1996). When looking at inhibitors to e-
commerce in SMEs, the ignorance about e-commerce benefits inhibits its adoption (Jones, Beynon-Davis, & Muir, 2003). Researchers agree with this position on e-commerce and the competitiveness of small enterprises in Melbourne, stating that knowledge and awareness about the benefits of e-commerce motivates small businesses to adopt increasingly sophisticated e-commerce solutions (Castleman & Chin, 2002). Perceived complexity plays a role in the motivation or inhibition of e-commerce adoption by small and medium enterprises. Complexity is also a major inhibitor of the adoption of e-commerce. Conversely, research shows a strong link between management attitudes towards e-commerce and the level of e-commerce adoption. The characteristics of senior management play an important part in the level of ecommerce adoption (Al-Qirim, 2003). The involvement and interest of senior management in e-commerce initiatives would lead to the deployment of additional resources devoted to e-commerce implementation (Al-Qirim, 2003).

Issues considered by SMES to be strategically important have been assessed. Issues of marketing, leadership and waste reduction have been given highest priority, while supplier development, financial management, time to market and supply chain management have a medium priority. Perhaps unsurprisingly, the lowest priority was given to technology, research and development and customer management – all closely related to e-commerce. The alignment of e-commerce with the organization’s strategy and processes needs to be present for an organization to adopt e-commerce. Small businesses reported that the adoption of an e-commerce solution was inhibited when not aligned with the organization’s strategy and processes (Love, Irani, Li, Cheng, & Tse, 2001). The e-commerce solution has to be applicable to the organization to motivate adoption, hence the need for alignment between e-commerce and the strategic context of the firm.

In further research, e-commerce adoption by several hundred SMEs was analyzed and found that fewer than 15% had a formal documented e-commerce strategy which is a limiting factor in adoption (Meckel, Walters, Greenwood, & Baugh, 2004a). It is not just knowledge about e-commerce, but that it is also important for SMEs to gain knowledge about how e-commerce affects the firm and its environment. Over-reliance on third parties to provide knowledge and expertise would make redundant the need to acquire knowledge, with the firm’s learning and strategy development processes being hijacked by external parties. There is pressure for SMEs to conform to industry standards or to a competitor’s level of technology.

A majority of SMEs would decide to implement e-commerce if the level of adoption in the industry was high enough (Castleman & Chin, 2002). E-commerce adopters do so to keep up with the times and with shifts in industry practices (Castleman & Chin, 2002). This is consistent with the theory of critical mass, which states that adoption in an industry would be self-sustaining once a certain level of adoption is reached (Markus, 1987). Adoption would take place in the organization if a high level of adoption occurred in the industry (Castleman & Chin, 2002). Another reason to adopt e-commerce is for SMEs to gain a strategic edge over competitors. Being in a strategic alliance affects the barriers to adopting e-commerce due to the fact that a strategic alliance would provide the organization with more technical and business knowledge about e-commerce. A useful guide to risks and rewards of e-commerce for small and medium enterprises produced by Computer Weekly (King, 2004) suggests that the level of risk and reward can be accessed through a combination of four factors namely revenue, reputation, strategic importance and regulatory compliance.

### 2.4 Role of Strategy in E-Commerce Adoption

Most firms surveyed do not have a specific e-commerce strategy in place which explains the low levels of adoption since businesses lack a formal plan to guide e-commerce development. According to (Doherty, Ellis- Chadwick, & Hart, 2003), companies that do not have a formally defined and coherent e-commerce strategy are less likely to use higher levels of internet services. In further research, researchers (Meckel, Walters, Greenwood, & Baugh, 2004) analyzed e-commerce adoption by several hundred SMEs and found that fewer than 15% had formal, documented e-commerce strategies which are a limiting factor in adoption.

Although the internet is a unique marketplace, the same principles of strategy and business apply. Successful e-commerce strategies involve using the internet to leverage and strengthen existing business rather than destroy existing business, and to use the internet to provide products and services that competitors cannot copy in the short-term and that means developing unique products, proprietary content, distinguishing processes like Amazon’s one-click shopping concept, and personalized or customized services and products (Porter, 2001). Adopting a strategy of cost competition means a business has discovered some unique set of business processes that other firms cannot obtain in the marketplace. E-commerce offers some new ways to compete on cost. Firms can lower the cost of order entry by having a single order entry system worldwide; and leverage richness, interactivity, and personalization by creating customer profiles online and treating each individual customer differently without the use of an expensive sales force that performed these functions in the past. The firms can also leverage the information density of the web by providing customers with detailed information on products, without maintaining expensive catalogs (Laudon & Traver, 2009).

There are further two other generic business strategies; scope and focus (Laudon & Traver, 2009). A scope strategy is a strategy to compete in all markets around the globe, rather than merely in local, regional, or national markets. The internet’s global reach, universal standards, and ubiquity can certainly be leveraged to assist businesses attain a global presence and become global competitors. On the other hand, a focus strategy is a strategy to compete within a narrow market or product segment. This is a specialization strategy with the goal of becoming the premier provider in a narrow market. E-commerce offers capabilities for a focus strategy. For example, firms can leverage the web’s rich interactive features to create highly focused messages to different market
segments; the information intensity of the web makes it possible to focus e-mail and other marketing campaigns on small market segments; personalization and related customization means the same products can be customized and personalized to fulfill the very focused needs of specific market segments and consumers.

2.5 Organizational Factors

The empirical results supporting the influence of organizational characteristics suggest that the determinants of e-commerce adoption are employees’ knowledge of e-commerce (Scupola, 2008) and the size of the enterprise (Zhu & Kraemer, 2005). These results are dissimilar to findings reported by Joen (2006) with regard to the employees’ knowledge of e-commerce and to reported results by Vilaseca-Requena (2007) with respect to the resources of the enterprise.

Huy (2012), in a study on the significance of organizational determinants as factors of adoption also found that employees’ knowledge of e-commerce, size of the enterprise, and attitudes of managers towards innovation were positive and statistically significant. Other findings also confirm the positive relationship between the attitudes of managers towards innovation and adoption (Al-Qirim, 2007), but the relationship is not significant regarding knowledge of the new information technologies of e-commerce.

According to Dubelaar (2005), the level of education of the owner/manager has a positive and significant relationship with the likelihood of adopting an innovation. Similarly, Ramdani et al. (2009) found that lack of knowledge was the main barrier to the use of e-commerce and ICT among MSMEs. Chang and Tung (2006) found that the CEO’s knowledge of technology has a significant relationship with e-commerce adoption among MSMEs. Nguyen (2009) also found a statistically significant relationship between the status of e-commerce in the SMEs and the perception of lack of knowledge as a barrier. These results support the view that having adequate education level by the owners or managers of MSMEs alone is not a necessary condition for such firms to adopt e-commerce, but they must also have relevant knowledge in ICT use.

Lun (2012) found that organizational size, which is an indicator of the level of operational resources of the company, is positively and significantly related to e-commerce adoption. This is in line with earlier studies by, for example, Zhu and Kraemer (2002) and Adeyeye (2008). On ICT skills and experience by employees. Sparling et al. (2007) found that the higher the level of ICT skills, the higher the likelihood that a firm will adopt e-commerce. That is, previous IT experience has been observed to be an important factor influencing the success of e-commerce adoption. Filiarlaut and Huy (2006) found a significant relationship between types of business (governmental, local, or foreign organization; characteristics of products; and number of product categories) and the likelihood of e-commerce adoption.

2.6 Environmental Factors

Huy (2012) found a positive correlation between e-commerce adoption and the manager’s perception of the intensity of competition, support of industry pressure, supplier and buyer behaviour, and sector of business operations. These findings conform to those of prior studies by Al-Qirim (2007) but are inconsistent with those of Joen (2006) and Vilaseca-Requena (2007). It has widely been argued that the industry in which the firm operates influences the adoption of information systems, including e-commerce innovations. Service industries, retail industries, and the manufacturing industry were the key sectors that demonstrated a significant relationship with innovation adoption. The authors further established that usage of information systems varies not only across sectors but also within the constituent sub-sectors.

The role of market scope as a predictor of the adoption of e-commerce can be explained from two main perspectives. Firstly, internal coordination costs increase as firms expand their market reach due to increased administrative complexity and information processing. Secondly, external costs (search costs and inventory holding costs) would also increase with market scope; that is, when firms expand their market reach, they incur search costs, which include searching for consumers, trading partners, and distributors. Arguably, firms that serve broader markets are more likely to adopt e-commerce, thus SMEs with greater market scope are more likely to adopt e-commerce.

Vilaseca-Requena (2007) has also established that there is a positive and significant relationship between competitive pressure and the adoption of e-commerce. The plausible argument for this observation is that if the innovation directly affects the competition, then the adopter will have an incentive to take up the technology. According to Vilaseca-Requena (2007), the greater the competitive pressure the more likely that SMEs will adopt e-commerce. There is also evidence that the growth of third-party information systems support has a significant influence on the likelihood of e-commerce adoption whereby the greater the external support, the more likely they will be adopted by SMEs.

Porter (2008) has suggested that the adoption of IT will change the competitive environment in three ways: through changing the structure of the industry, changing the rules of competition, and giving businesses new methods by which to gain competitive advantage over the competition. According to Sandy and Graham (2007), intensity of competition is associated with the degree of e-commerce adoption and that competitive pressure is a critical factor influencing the extent of e-commerce adoption among SMEs.
In contrast, Pan and Jang (2008) found that competition has very little influence on the adoption of new technologies or e-commerce in small enterprises. But a study by Thomas and Simmons (2010) produced contrary results. A relationship also exists between the intensity of competition in an industry and the degree of adoption of electronic commerce. According to Kinyanjui and McCormick (2002), ensuring competition and entry opportunities for other market players, particularly smaller ones, must be an on-going policy priority. Intensity of competition is measured by the number of competitors in a given sub-sector category.

Regarding information intensity, SMEs in a more information-intensive environment are more likely to adopt e-commerce technology (Pavic, 2007). For instance, these authors found that MSMEs in service-oriented industries are more likely to have higher information content in their products and services in comparison to SMEs in manufacturing-oriented industries. Hence, MSMEs that are oriented to the service industry are more likely to adopt e-commerce technology. Al-Qirim (2007), who investigated the impact of information intensity on the adoption of e-commerce among MSMEs, found that the information intensity was influenced by the adoption of the technology.

### 2.7 Technological Factors

The decision to adopt a technology according to Cupolas (2009) is not only dependent on what is available on the market, but also on how the new technologies match with those that a firm already possesses. The key factors characterizing such technologies include attributes such as relative advantage (perceived innovation benefits and impact), compatibility (both technical and organizational), and complexity (ease of use or learning e-commerce).

Regarding relative advantage, Joen (2006) found that the extent of perception of the characteristics of the technology as measured by time saving and effort (To & Ngai, 2007), economic profitability, cost reduction, and production increase has a significant influence on e-commerce adoption. In contrast, Huy (2012) found that perceived relative advantage does not seem to play an important role in influencing the adoption of e-commerce by SMEs.

Compatibility has been found to be a significant determinant of adoption because it deals with perception of the importance of the innovation in performing various tasks presently and in future. For instance, if e-commerce is compatible with the traditional way of performing various activities of a business enterprises, with the existing values and mentality of the professionals, and with different communication parts involving day-to-day operations and their future development, then a higher rate of adoption will occur. Grandon and Pearson (2004) also found that compatibility with a firm’s culture and values was a statistically significant determinant of e-commerce adoption, a result that is also in line with studies by To and Ngai (2007). The implication of this observation is that the management of the MSMEs considers compatibility of the innovation as an important pre-requisite for technology adoption.

Ratten and Ratten (2007) found a significant relationship between perceived observability and the adoption of e-commerce implying that the various beneficial operations of e-commerce may influence the decision by SMEs to adopt the technology. Confidentiality and security have been discussed broadly both in academia and practice. Confidentiality is defined as the ability to control and manage information about oneself, while security refers to the ability to protect against potential threats. From the consumers’ standpoint, security is the ability to protect consumers’ information from information fraud and theft in the online banking business (Hua, 2009).

Since the year 2000, online services security has become gradually noticeable as a critical issue, particularly, after a number of well-publicized attacks on prominent Internet sites. Due to such attacks, companies endeavour to base their e-commerce adoption decisions on the innovation’s security and confidentiality. Therefore, heightened security concerns could stop potential damages ensuing from insecure transactions, hacking, or poor access control to important data. Hesson and Alameed (2007) and Belkhamza and Wafa (2009) found that security and confidentiality issues and the system risks of e-commerce are the major determinants of adoption behaviour.

A number of studies, for example, Lee (2011) and Maha and Aqela (2012) found a significant relationship between trailability and e-commerce adoption or intention to use. Trailability is defined as the degree to which an innovation could be tried out on a limited basis (Rogers, 2003). In other words, the test drive of an innovation is provided by the technology’s trailability and its ease of use. Trailability offers a chance for customers to evaluate an innovation such as e-commerce and its benefits. Thus, opportunities which allow latent adopters to have prior experience with a new innovation or product would reduce their fears and uncertainties. In addition, when a new idea or innovation is trailable, any doubt or vagueness associated it will be dispelled and hence an increase in the level of confidence in its use.

According to Rogers (2003), complexity is the degree of difficulty associated with understanding and learning how to use an innovation. Grandon and Pearson (2004) and Mahazir and Mohd (2012) found that perceived complexity is a vital factor influencing the decision to adopt e-commerce and that the likelihood of adoption of the innovation is inversely related to the perceived complexity variable especially amongst the MSMEs. The introduction of new technology might require the employees to develop new skills in order to use the technology. Rogers (2003) contends that the new technology can be intimidating, particularly if it requires change in the existing businesses practices or acquisition of new skills. The measurement of perceived complexity or ease of use can be in the context of how e-commerce can be easily controlled, the degree of flawlessness, reasonableness, and adaptability to changes, user
friendliness, and how easy it is for one to become skillful in using e-commerce.

The literature reviewed so far suggests that the available theories of adoption of innovation focus mainly on organizational, technological, and environmental contexts. It is also evident from the literature that a number of studies have attempted to address the determinants of adoption from different perspectives. Alam and Ali (2011), for example, attempted to gain a deeper understanding of the factors that influence the adoption and usage of ICT by SMEs in Malaysia. They found that ICT provides numerous opportunities for MSMEs to compete equally with large corporations.

E-commerce is a critical part of business strategy for most adopters as it provides an advantage in new business opportunities, customer service, and cost reduction, efficiency, and new product development, access to international markets, marketing and communications. Furthermore, while some SMEs have not adopted e-commerce, generally there is a positive perception of the business value of e-commerce. A meaningful impact on the industry structure is to be expected if the level of adoption in the industry attains the critical mass threshold. Firms should strive to achieve this critical threshold. The government/policy makers should make polices that are enterprise friendly by reducing costs of trading using e-commerce.

3. METHODOLOGY

This research began with a wide-ranging literature review. This also included a review of documents of various organizations involved with e-commerce such as the Communications Authority of Kenya. From this review, previous work was identified and also evidence of research design and methodology was found. The collection of primary research data proceeded in two stages, using a qualitative research design and a quantitative research design. Questionnaires (quantitative) and personal interviews (qualitative) were used as instruments for data collection to locate where quality of service can be improved to ensure customer loyalty and reveal the overall impact of the internet in the e-commerce environment. The use of questionnaires and personal interviews also helped to identify where stability in the retail environment could be enhanced to ensure that an effective e-retail benefits are gained.

The researcher collected data through questionnaires to examine how e-retailing improves customers shopping experience. The survey method was considered useful for this particular project because it carries good and accurate study of the population surveyed (Saunders, Lewis & Thornhill, 2003). Identifying the needs of e-customers with a view to satisfying them is important to e-retailers. The survey method through the design of questionnaire has generated useful empirical data that can be used to develop appropriate e-retail strategies. It is also convenient to generate comparative data that is used to analyze dependent variables. While case study method requires long period of time in the field and emphasize detailed observational evidence, the survey method can generate quick data (Jones & Smith, 2001) cited in Saunders et al. (2003). Convenient shopping is an important element for e-shoppers, investigating this through survey questionnaires provides the basis for this research.

One hundred and fifty respondents were targeted for the completion of the questionnaire and these respondents are expected to be able to read and understand the questions, computer literates and internet users. Therefore, the implications of age, literacy level and visual ability were taken into consideration (Denscombe, 2003). Areas that were investigated include the quality of goods and services available to e-customers, customers’ satisfaction and profitability. These areas of enquiry were derived from the research domain. Denscombe (2003) states that the premise of using a questionnaire is that it can be used generate the right information from the respondent. The reason for using this method is to ensure that varieties of data and sources used are relevant to a broader spectrum of e-commerce businesses, particularly those involved in e-retailing.

Interviews were chosen for the investigation of management viewpoints because of the uncertainty of the outcome (there views could not be anticipated so as to design a questionnaire) and because they were few in number. The interview sample was made up of seven e-commerce and e-business professionals whose experiences are based upon work in South Africa and the United States. The professional e-retail experience of the respondents ranges from three to ten years. The respondents were required to participate in a 45-minute semi-structured interview. The researcher had a list of themes and questions to be covered. During the interview, the extent to which the respondent understands the questions were determined (Denscombe, 2003). The objective of the interviews was to help reveal how e-retail businesses ensure customer loyalty in the e-commerce environment.

The population of this study was derived from different business entities i.e.: restaurants, pharmacies, clothes stores, delivery/distribution companies, grocery stores, coffee shops, supermarkets and electronics shops, whose operations are deemed to require e-commerce integration to achieve maximum efficiency in the present economic environment. The researcher administered one hundred and fifty questionnaires (150) through hand delivery and web-based methods. The group of respondents comprised of working class people, credit card holders and students from who live within and on the outskirts of Nairobi.
These respondents were randomly selected and contacted. Out of the one hundred and fifty people contacted, seventy (70) respondents returned completed questionnaires. This represents 47% response rate from the questionnaire. This success rate was achieved because the questionnaires were administered electronically. Respondents see this as more convenient, user friendly and less time consuming than the manual process.

Purposive sampling involves the researcher specifying the characteristics of the population of interest and locates the individuals with those particular characteristics (Johnson and Christensen, 2010). In this study, purposive sampling shall be used to obtain the sample frame. This will involve consciously choosing a selection of the population that will fit the criteria of the study. The objective is to identify companies for in-depth examination governed by what is relevant to the study.

After selecting and finalizing the tools for data collection, the researcher contacted the firms under investigation personally for taking prior permission from the respective businesses for collecting the necessary data. Subsequently, the investigator discussed in detail about his investigation with managers of the respective businesses and sought the permission from them for collecting the necessary data and explained about the nature and purpose of the study. Good rapport with the owners and consumers of concerned businesses was established to do the assignment carefully. Before assigning the task, instructions of each test used in the study were made clear. In order to giving responses to the questions free and frankly, honestly and sincerely, they made aware there are no right or wrong answers to these questions and their persona would not be affected as it was only an exercise for research purpose and their responses would be kept strictly confidential. Each session of testing ended with a vote of thanks to the subjects concerned.

The pilot phase of this study was conducted within the Nairobi Central Business District because of easy access and facilities in terms of transport and communication and the geographical location provides an overview of socio-economic, demographic and educational characteristics of the larger Nairobi region. A total of seventeen business owners/managers and twenty-five consumers participated in the pilot phase. Selection procedures were based on convenience, but care was taken to ensure that participants represented the various dimensions that are important to the study in terms of age, gender, professional qualifications, experience and geographical location.

Various techniques were employed for the researcher to gain a more in-depth understanding of retailers’ and consumers’ experiences and perceptions towards e-commerce. This included conducting interviews with key informants, reviewing secondary data and conducting open and closed response questionnaires to both retailers and consumers. First, data reduction allowed the researcher to sharpen, sort, focus, and organize the data to enable conclusions to be drawn. Second, data verification enabled the display of data in reduced form making it possible to draw conclusions/verify results. The review of the literature, comments from questionnaire respondents, the comments of the interviewees and the resulting findings are all analyzed and interwoven in the next chapter.

4. RESEARCH FINDINGS, SUMMARY, RECOMMENDATIONS AND AREAS FOR FURTHER RESEARCH

4.2 Research Findings
4.2.1 The demographics of the e-retail companies
The first demographic question asked was how many employees the company has. Three of the respondents indicated that their company has fewer than 20 employees, two companies have more than 50 employees and two companies also have more than 500 employees. This question was asked to ascertain the size of the company - small, small-medium or large.

Small sized e-retail businesses are financially limited and their service and product offerings are also limited. This could be a hindrance for such business in implementing the best business strategy for the growth of the business. Strategies such acquiring a greater market share or improving service quality through the introduction of various technologies and functionalities for an effective customer shopping experience. Large or medium sized businesses have more advantage of offering a complete service online, e.g. payment and delivery.

Each of these businesses was asked how long they have been in business: 14% of the e-retail businesses have been in business for the period of 2 to 4 years. 43% have been in business for a period of 5 to 7 years, 14% - 8 to 10 years and 28% more than 10 years. These e-retailers that have been in business for 4 years or less did not see e-retailing contributing a high or fairly high percentage towards the company's overall profit margin. This is result of not being in the business for longer to help monitor and determine the growth.

In the finding, 43% of the businesses interviewed incorporated e-retailing at the initial stage of their business model development, 29% at the middle stage and 29% at a later stage. Businesses that incorporated e-retailing earlier or at an initial stage had the benefit of acquiring more market share. They were able to achieve that by listening to their customers’ complaints, satisfying their needs and improve service quality. Some of these early adopters also failed initially because an existing e-retail business model was not available rather they had to create one and try it out. E-retailers that included e-retailing at the middle or later stage had the privilege to learn from the doom of other companies and try not to repeat same failed model.
4.2.2 E-RETAIL IMPACT
According to one of the interviewees, e-retailing has impacted on their company's general business activities. They had to implement new strategies and processes in their shops and made sure they worked. They also had to develop new competencies, such as managing the unfamiliar issues that arise from partnerships. The experience of outsourcing partnerships with delivery companies, IT service providers and call centre operators all presented new challenges to the business. These findings have helped to have an overview e-retail companies views on the following; reasons for moving into e-retail business, the experience and products and services offered, impact of e-retailing on existing traditional shop, E-commerce managers' view on customer loyalty and the impact of e-retailing on business strategy.

4.2.3 Reasons for moving into e-retailing
Respondents were then asked what led to the move into e-retailing, 29% said that it was to increase sales, 43% said it was to improve customer relations by providing better service, 43% said that the decision was driven by competition while 14% responded that it was a new concept introduced to help reduce overhead costs. In this question, the respondents could choose more than one option and could also add any additional reason. Competition was one of these reasons and another was because e-retailing is a global thing, said one of the respondents. Figure 4.1 provides explanation on why companies embark on e-retailing and it is leadership in what they do over their competitors.

The main focuses for the research were evident in the response of the e-retailers and this includes; improved product and service quality, customer loyalty and increased market share and profitability. Improving customer relations and loyalty through improvement of service quality is seen as great importance to the business. Increase in sales was rated as less important.

Figure 4.1: What has led to the move into e-retailing

4.2.4 The experience and products and services offered
The experience according to one of the respondents has been complex, difficult, painful, challenging and exciting. One of the respondents continues; “It's a very difficult marketing invention. The advantages from our company's perspective are that we already set our own rules and set our own brand. Also, people understand the brand. The disadvantage is that the brand has already been created in terms of it being something that we dare not break. So, in whatever we do, we have to consider the fact that our company is in question and we also have to be exceedingly careful in whatever decisions we are taking”. The table 4.1 lists all the products and services offered by e-retailers interviewed and the right-hand column is the proportion of responding companies.

<table>
<thead>
<tr>
<th>Products and services offered</th>
<th>Proportion of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Hardware</td>
<td>43%</td>
</tr>
<tr>
<td>Computer software</td>
<td>14%</td>
</tr>
<tr>
<td>Books</td>
<td>29%</td>
</tr>
<tr>
<td>Travel</td>
<td>14%</td>
</tr>
<tr>
<td>Music, video (CO's, OVO's, audio)</td>
<td>43%</td>
</tr>
<tr>
<td>Domestic &amp; kitchen</td>
<td>43%</td>
</tr>
<tr>
<td>News</td>
<td>14%</td>
</tr>
<tr>
<td>Tickets</td>
<td>14%</td>
</tr>
</tbody>
</table>
The purpose of the above question is to compare the retailer's choice of products and services with the customers' wants and needs. In order for e-retailers to maximum benefit from e-retailing, there is a need to identify the needs of their customer and make provision for it.

### 4.2.5 Impact of e-retailing on existing traditional shop

Furthermore, the respondents were asked if they have an existing traditional shop. 43% of the businesses have traditional shops while 57% said that they only operate online. Those e-retailers who have traditional shops were asked the effect of e-retailing on their company's traditional shop. 43% of the interviewees believe that e-retailing does not have much impact on their traditional shop. At the initial stage, the concern was that e-retailing would take away substantial part of the traditional shop's trade but it did not. The 57% that does not have traditional shops responded 'no effect'. However, there were fears that employees might lose their jobs in the shops due to this, but job losses have proved to be negligible, according to e-retailers who have traditional shops.

### 4.2.6 E-commerce managers' view on customer loyalty

When respondents were probed to obtain their opinion on their customers' shopping experience, most of the respondents felt that people see shopping as an experience and a way of socializing and not just buying goods. Customers buy emergency goods from the Internet and still go out on weekends to do weekly or monthly shopping. This is part of socializing and not just shopping. Customers who order via the Internet also shop at the traditional shop.

One of the respondents illustrated further, when customers purchase from the internet or traditional shop, the data about what they buy is linked to the company loyalty card, so the company knows who their customers are irrespective of the channel the customer uses. If the customer logs onto the company website through a home computer or PDA, their favourite or recently purchased items will be listed whether they bought in a store or online. The company has extended this card membership system to every person that walks into the shop. After a period of time customers who have accumulated points will be rewarded with a voucher based on how much they have spent in the shop. The company uses this method to track other noncard carriers, at the same time retaining the existing customers and attracting new ones.

All the e-retail respondents mentioned improved customer service as one of the ways e-retailers could maintain customer loyalty. These respondents recommend that e-retailers must leverage customer information for the effective management of customer relationships on the Internet. Such strategy, according to the e-retailers interviewed suggests something much more radical than the basic e-commerce approach adopted by many e-retail businesses at the moment. It calls for a re-engineering of processes and structures focused around key customer groups, rather than product or service divisions. It also implies cross-functional, team working. As Siegel (2000) puts it, the customer-led company has a broad interface across which all employees can get to know their customers. Employees invite customers in to collaborate on new products, support systems, and methodologies. Facilitating those interactions will take new communication skills, new tools, and the ability to move people in and out of product teams easily. In order for e-retailers to attract a higher percentage of e-customers, they will need to take their (e-customers) suggestions into consideration in order to attract new ones as well as retain loyal customers.

### 4.2.7 Impact of e-retailing on business strategy

The entire e-retail managers noted that e-retailing has provided them with an opportunity to maintain a global reach and to promote their services to a wider audience. 43% believe that e-retailing helped them to increase the company profit margin, 57% felt e-retailing has provided them with worldwide visibility and 71% believed e-retailing has assisted them in maintaining the company's accessibility to customers. 43% mentioned that e-retailing enabled them to incorporate targeted marketing, shorten transaction times (better customer service) and reduce manpower. 29% of the respondents stated that e-retailing helps the company to manage its franchise stores in different regions.

Five of the respondents were of the opinion that the administration costs have increased. Two respondents were unsure. These five respondents have established that the focus changed and the marketing department became the driving force followed by sales and IT. In these cases, a totally new division was established where they had to implement a number of new functions to accommodate e-retailing. These had to do with IT systems and links to back end systems. It was also stated that in this shift to a new paradigm there is a need for faster decision making, more flexibility and empowerment, and old habits had to be unlearned. One respondent stressed that their initial model, which was to implement e-retailing within the existing infrastructure, was a mistake. Operationally they had to
change their strategy in order to facilitate order taking and credit verification, and the delivery procedure had to be speeded up. New analytical procedures also had to be implemented to track performance.

However, one of the respondents felt that the buying of large bulky goods on the Internet requires high delivery cost, and this means that the cost of delivery is disproportionately high compared to the value of the goods. This is why people who are leaders in Internet retailing are those who deal in goods such as books, records, flowers; things that do not require special delivery arrangements.

The respondents were then asked what they understand their customers' needs to be, and to rate them, in order of importance. The question was asked to compare the e-retailers' responses with e-customers responses.

![Fig 4.2 E-retailers understanding of customer needs](image)

The chart shows that all the respondents' rated product-level satisfaction and order status as very important to customers while interest in new potential products/services and tools to better manage their business as least important. All the respondents agree that moving their business online has attracted more customers for them. However, they suggest that in order to continue attracting new customers when trading over the Internet they need to be able to provide 'service, service, and service'. The respondents all admitted that they have not begun to achieve that yet. However, they need to continue finding new ways to cater for their customer needs and maintain service quality. One of the biggest problems identified by two of the respondents is being out of stock. This puts the company in a situation where they have to try to second-guess what the customers would want that is in stock. As an e-retail company the first thing, according to the respondents, is to make sure that the company does not run out of stock.

The advantages of e-retail business introduction from one of the respondent's perspective were that they already have the brand and also people understand the brand. The following were also identified by the respondents as the benefits of e-retailing to their company;

<table>
<thead>
<tr>
<th>Benefits</th>
<th>% of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extending customer reach</td>
<td>100</td>
</tr>
<tr>
<td>Promoting our services to a wider audience</td>
<td>100</td>
</tr>
<tr>
<td>Increasing company profit margin</td>
<td>43</td>
</tr>
<tr>
<td>Providing customers with convenience</td>
<td>43</td>
</tr>
<tr>
<td>Worldwide visibility</td>
<td>29</td>
</tr>
<tr>
<td>Accessibility of company to customer</td>
<td>71</td>
</tr>
</tbody>
</table>

The disadvantage according to one of the respondents is that the brand has already been created in terms of it being something that they dare not break. In other words, in everything they do, they have to consider the fact that the company is in question. They also have to be exceedingly careful in whatever decisions the business takes so that it does not crumble which would result in the 82C site needing to start from scratch again.

4.2.8 E-CUSTOMER SURVEY RESULTS

4.2.8.1 The demographics of e-customers

E-customers were asked to indicate their gender, age, occupation, area of residence, approximate income and the highest qualification they have obtained. The objective of these questions is to group the respondents into various categories. This will be used to identify the factors that influence each respondent's usage of the internet and the possibility of becoming an e-customer. The table below shows the sections of the demographics used in the questionnaire and the percentage responses.
Table: 4.3: Demographics, category and response rate

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Category</th>
<th>% Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>54</td>
</tr>
<tr>
<td>Age</td>
<td>18-30</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td>31-45</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>46-60</td>
<td>18</td>
</tr>
<tr>
<td>Occupation</td>
<td>Student</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>Officer</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Professional worker</td>
<td>50</td>
</tr>
<tr>
<td>Area of residence</td>
<td>Major city</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>City</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Town</td>
<td>14</td>
</tr>
<tr>
<td>Approximate income (Ksh. ‘000)</td>
<td>10-20</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>21-50</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>51-100</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Above 100</td>
<td>8</td>
</tr>
</tbody>
</table>

The table clearly indicates that more females use the Internet compared to males and the age of Internet users that responded ranges from 18 to 60 years. The age result has proven that age is not such a factor that determines a user's capability of utilizing the Internet. 70% of the respondents are professionals in the occupation category. This could be linked to how often they utilize the Internet, the medium and mode (Laptop or desktop and ADSL - Asymmetric Digital Subscriber, 3G - Third Generation connection or Wi-Fi - Wireless Fidelity connection) of accessing the Internet, their financial status (10001-20000 Ksh.) as well as having a better opportunity of becoming an e-customer. This category of respondents has greater opportunity of engaging in e shopping at some stage.

4.2.8.2 E-customers reasons for using the Internet

E-customers were asked to indicate factors that affect their decision in accessing the Internet. E-customers were allowed to choose more than one option. This question was posed to find out if shopping will stand as the main reason for using the internet.

The graph shows that the Internet as a convenient means of shopping has the lowest rating with 27%. This shows that respondents use the Internet for other purposes and more than for shopping. The questionnaire results also show that respondents utilize the services offered by companies on the Internet such as news (65%), general interest in browsing or for fun/leisure (67%). The respondents use the Internet more for work purposes (90%) and for communication (82%). These two reasons were the most highly rated.

Most of the respondents noted several other reasons why they do not purchase from the Internet: unfamiliar vendor, not enough information, lack of socialization with customers, and a preference for human contact as opposed to a computer. These e-customers gave suggestions on how e-commerce businesses could improve their websites to enable them to keep coming back to the site for transactions. These suggestions included; to expand range of products (46% respondents), to expand availability of products (12% respondents), to improve provisions of security and privacy (20% respondents), to reduce high cost of total purchase (10% respondents), to improve ease of use of the site (20% respondents) and to make websites easier to find (16% respondents). In the discussion of the interview results, two of the e-retail businesses interviewed focused on improving the speed of the website rather than the products offered.
than the layout. When compared to e-customers suggestions listed above, it is evident that to improve speed aligns with ease of use of the company website.

4.3 Summary of Findings

Several empirical studies have investigated the effect of organizational, environmental, and technological factors on e-commerce adoption. Many of these studies, however, are concentrated in developing countries or they have invariably produced conflicting results as discussed in chapter one. Although, these studies attest to the fact that key organizational, environmental, and technological factors influence e-commerce adoption by different magnitudes, few have attempted to demonstrate the effects of these factors against the background of existing SME environment. This study, therefore, was conducted to investigate the impact of key determinants of the e-commerce adoption in order to identify and analyze strategic challenges of e-commerce in the SME sector in Kenya.

The specific objectives of the study were i) analyze the use of internet technology in ensuring convenient e-commerce experiences; ii) examine the effect of the determinants of e-commerce adoption among Kenya’s MSMEs; and iii) investigate the effect of the interaction of the various determinants for improved e-commerce service delivery. Primary data were collected from a sample of SMEs operating in Nairobi, Kenya. In order to address the first objective of analyzing the e-commerce environment within Kenya’s SMEs sector, the study derived factors characterizing the e-commerce environment in the context of firm size. On organizational factors, the results revealed that the SME sector was characterized by young owners/managers (with majority being less than 45 years) mostly male, with at least high school/technical education. The sector was also characterized by firms with significant levels of ICT capacity, which increased with firm size.

The major environmental factors of the MSME sector in the context of e-commerce adoption were that a greater proportion of the small and medium enterprises experienced the effect of customer pressure, competitive intensity, and supplier pressure. The analysis of technological and organizational factors indicated that e-commerce was associated with better relative advantage, innovation complexity, trailability, compatibility, observability, and security/confidentiality. The level of significance of the factors for innovation adoption increased with increasing firm size.

The second objective of the study was to identify and analyze the effect of the strategic challenges of e-commerce. The study found the existence of a significant relationship between e-commerce adoption and owner/ manager’s age, level of education, gender, age of firm, firm size, and ICT capacity. The study also found that e-commerce adoption was significantly affected by supplier pressure, sector of business operation, market focus, competition intensity, and customer pressure. The study further showed, with regard to technological factors, that there was a significant relationship (directly and inversely) between e-commerce adoption and perceived compatibility, perceived complexity, perceived observability, perceived trailability, and perceived security/confidentiality.

The third objective of the study was to investigate the effect of the interaction of the various determinants for improved e-commerce service delivery. The objective of the analysis was to determine the effect of the interaction of the various factors on the significance of the coefficients and direction of the influence of independent variables. The results showed integrating the business profile with technological and environmental factors resulted in no change to the direction of the influence of position in the firm, age, and gender variables on e-commerce adoption.

Regarding the effect of interaction of the technological factors, the results showed that there was no change in the direction of the influence of perceived relative advantage, complexity, and security/confidentiality, but the direction of influence of trailability, observability, and compatibility changed from direct to inverse. Finally, the findings revealed that, due to interaction of the variables, there was no change in the direction of the effect of supplier pressure, sector of business operation, competition intensity, and customer pressure. The study, however, showed an improvement in the statistical significance of the sector of business operation, competition intensity, and customer pressure.

4.4 Recommendations

4.4.1 Product and Service Quality

The delivery of accurate product information on the Internet and timely response to customer’s query are seen as crucial to e-customers. Therefore, to ensure that customer loyalty is achieved and sustained e-retailers should present accurate product information on the website regularly. Poor site management by e-retailers as evident in the survey results shows that e-customers are not satisfied with old data. Overcoming this requires commitment to content management culture that present a formidable shopping experience that guarantee customer loyalty. If the e-retailing opportunity is to be sustainable, profitable and useful to e-customers, there should be more aggressive development and deployment of effective and efficient e-retail strategy that address the many challenges experienced by retailers. A disappointing situation can be avoided by ensuring that e-retail transactions are reliable at all times to avoid the out-of-stock scenario usually experienced.

4.4.2 Customer Satisfaction and Loyalty
Customer loyalty is a critical component for a successful e-retail business. This has been evident in the literature review section where most experts argue that satisfied customer will remain loyal despite alternative product and service offers from competitors. Having loyal customers suggest that companies can reduce operating costs; get extra business from referrals (have lower customer-acquisition costs. It can also lead to increased product penetration; high profit due to initial absorption of costs and premium pricing opportunities. While these factor amount to real e-retail benefit, they also have limitations in terms of appropriate strategies that can meet set objectives. This study shows how limited small retailers are in terms of resources needed to deliver successful retail business operation.

It is argued in chapter two that the reduced product prices and improved service quality is an incentive that attract customers. Retaining these customers require up-to-date product and service information delivered timely on retail website. The reliance on high quality product and service by customers are accompanied by expectations of high level satisfaction that come with such products. E-retailing is a formidable tool that is used to keep in touch with customers more frequently at a cost-effective rate. It is also a management strategy that can be used by the retailers to keep their customers in check at all times.

Cost saving are realized by managing old customer more than seeking new market and new market opportunity with internet. The lack of understanding of customers need and taste can impede the development of appropriate strategy and improvement in the retail business operation becomes a costly exercise. This is why the researcher employs the survey method to understand the unique challenges facing e-retailers, study the strength and analyze these against the opportunities of e-retailing.

4.4.3 Improved Market Share and Profitability
Improved e-retail technique for products and services enhances the possibility of the business gaining market share and increased profit. Displaying products in three-dimensional view using technologies such as immersive video or virtual reality further enhances the functionality of an e-retail site. The enhanced website enables customers to interact and experience products from various dimensions that are suitable to various market segments. This additional functionality can generate additional revenue stream for the e-retailer. Improve market share and profitability resulting from innovative strategy leads to e-retail business success. Therefore, innovative strategy development that recognizes improved product and service quality are relevant component of this study. The impact of internet technology on strategy development and deployment are useful determinant of customer loyalty. Customers will now have the leverage of understanding offers of quality product and services before making purchase decision. The survey of e-customers shows high customer preference for e-retailers to expand range of products and services. These features are important factors for customers who rely heavily on useful and reliable product and service information for decision making purpose.

Good e-retail sites should address the above concerns and provide necessary assurance to customers to guarantee repeat purchase. The technologies necessary to perform these tasks are available today. Therefore, attracting new customers and retaining old ones should lead to increased profitability. From survey data three of the e-retail business respondents acknowledged the many problems of e-retailing. Overcoming these problems require adequate understanding of customers’ needs and developing innovative strategy to satisfy them. While the impact of internet technology on retail business is positive the many challenges of ensuring customer loyalty remain a strategic issue. Further research that investigates the impact of management strategy on e-retail business operation is recommended. The objectives set out in this study is to understand the impact of Internet technology on e-retailing and how this understanding can be used to develop and deploy solutions that improves the quality of products and services. It is also imperative from this that increases in market share and profit will result from sustained customer loyalty.

4.5 Areas of Further Research
This study sought to assess e-commerce adoption among Kenya’s MSMEs in Nairobi. Due to this limitation, it is recommended that further research be undertaken in the context of Kenya’s SMEs to enable the actual performance of the firms to be determined as a function of the extent of e-commerce adoption.

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