EFFECT OF FINANCIAL INNOVATIONS ON EFFICIENCY OF COMMERCIAL BANKS IN KENYA

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A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF BUSINESS ADMINISTRATION, SCHOOL OF BUSINESS, UNIVERSITY OF NAIROBI

NOVEMBER, 2018

DECLARATION

I, the undersigned, declare that this is my original work and has not been presented to any institution or university other than the University of Nairobi for examination.

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ACKNOWLEDGEMENT

I would like to thank the almighty God for successfully seeing me through the completion of this project. Many thanks to my employer that supported me complete my degree seamlessly. Special thanks to my family and friends for the tremendous support through this journey, I could not thank you enough. I am also very thankful to my supervisors Dr. Cyrus Iraya and Dr. Lishenga for their guidance and support during my research project.

DEDICATION

I dedicate this work to my mother Esther Makachia, my sisters Mercy and Bridget, my godchildren Leandra, Leone and Lucas who have been my source of inspiration from the beginning. Thank you for the love and unwavering support that gave me the strength to push to the finish line.

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LIST OF ABBREVIATIONS

ATM	Automated Teller Machine
CBK	Central Bank of Kenya
CBS	Core Banking Solution
ICT	Information, Communication & Technology
NSE	Nairobi Securities Exchange
POS	Point of Sale
RBV	Resource Based View
ROA	Return on Assets
SMS	Short Message Service
TAM	Technology Acceptance Model

ABSTRACT

Kenyan banks have embraced ATMs, POS, mobile banking, internet banking, agency banking and card business. Financial innovations are being used as a tool to cut cost, increase efficiency, deliver product varieties, and increase flexibility or for the mere purpose of being perceived as technology leader. Today, bank customers' enjoy efficient, convenient and fast banking services conveyed through financial innovations such as mobile banking, online banking and ATMS. This study sought to determine the effect of financial innovations on efficiency of commercial banks in Kenya. The study's population was all the 42 commercial banks operating in Kenya. Financial innovation in this study was the independent variable and was measured by the natural logarithm of total value of transactions through financial innovations (mobile banking, internet banking and agency banking). The control variables were liquidity as measured by the current ratio, firm size as measured by natural logarithm of total assets and capital adequacy as measured by ratio of loans and advances to assets total per year. Efficiency was the dependent variable which the study sought to explain and it was measured by the ratio of total revenue to total assets. Secondary data was collected for a period of 5 years (January 2013 to December 2017) on an annual basis. The study employed a descriptive cross-sectional research design and a multiple linear regression model was used to analyze the association between the variables. Data analysis was undertaken using the Statistical package for social sciences version 21. The results of the study produced R-square value of 0.172 which means that about 17.2 percent of the variation in the Kenyan commercial banks' efficiency can be explained by the four selected independent variables while 82.8 percent in the variation of efficiency of commercial banks was associated with other factors not covered in this research. The study also found that the independent variables had a weak correlation with efficiency (R=0.415). ANOVA results show that the F statistic was significant at 5% level with a p=0.000. Therefore the model was fit to explain the relationship between the selected variables. The results further revealed that liquidity produced positive and statistically significant values for this study. The study found that financial innovations, capital adequacy and bank size are non-statistically significant determinants of efficiency of commercial banks. This study recommends that measures should be put in place to enhance liquidity among commercial banks as this will improve their efficiency.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

In the dynamic and globally competitive environment, the inability of established banks to come up with breakthrough financial innovations that will help them operate effectively is a truism today (Davila, 2014). Financial innovation is part of strategy implementation that enhances firm performance through increased expansion and reduced risks (Drucker, 2001). Times have changed and so are the banking operations. Currently, account holders are able to interact with their financial institutions via a variety of channels than before and these channels have a significant impact on whether customers are satisfied and revenue generation. Hans and Kamath (2013) suggested that with the availability of a variety of financial innovations, account holders can now perform their banking transaction for instance, opening deposit accounts, fund transfers, paying utility bills, ordering demand drafts and cheque books, getting account statements and applying for loans without visiting a branch.

This study was informed by three theories. These are the financial intermediation theory, diffusion of innovation theory and the technology acceptance model. The financial intermediation theory was advanced by Mises (1912) who opines that financial institutions undertake a critical where they gather deposits and lend them out to get interest thus for them to boost their performance, they have to enhance customer deposits through development of channels that would facilitate easy and convenient transactions among customers. Technology Acceptance Model (TAM) clarifies the way clients embrace and make use of an innovative idea. TAM will be applied in this study to establish how technology acceptance influences financial

innovations among commercial banks in Kenya. Diffusion of innovation refers to the communication of an idea which is considered to be novel to the members of a social system through certain preferred channels. Innovations have to gain acceptability in a wide area in order to be sustainable. This theory has guided the study of the adoption of various technological innovations in businesses.

Since the collapse of many banks in 1990s, many challenges have been experienced in Kenya's banking sector. Many financial innovation services such as ATMs, internet banking and mobile banking have been adopted by commercial banks so as to reduce their operational costs. The Central Bank of Kenya deepened the scope of commercial banks in 2010 through allowing them to operate through licensed third party agents who could operate on their behalf. Regulated deposit taking microfinance institutions were further allowed in May 2012 by the central bank to operate agencies. Financial institutions and mobile network operators have rapidly adopted the use of agency banking and mobile banking. Safaricom introduced more than forty thousand mobile payment agents across the country in between 2007 and 2012. Approximately 10600 agents have been established by the ten prominent banks across the country with the Kenya Commercial Bank and Equity bank introducing more agency networks across the country than any other. All these models seek to reduce commercial banks' operating costs (Waithanji, 2016).

1.1.1 Financial Innovations

Financial innovations are methods used by banks to deliver customer services (Howcroft, 1993). These channels are described as branchless banking, since they allow the customers to access financial services without visiting actual bank branches. According to Kimball and Gregor (1995), terms including e-banking, electronic

banking, online banking, high tech-banking direct banking and virtual banking are also used by banks to describe alternative banking channels. Improvements in ICT have offered alternative banking channels to customers which allow the account holders to transact from within any location without physically visiting the financial structure. This has facilitated access to banking services by the unbanked population that are too busy to queue in the bank (Kumbhar, 2011).

According to Fisher (1998), the application of innovation in the current banking environment can be split into three categories: customer independent innovation (this innovation allows the customer to conduct and complete a transaction fully without any form of human contact with the bank e.g. ATMs, Internet banking and mobile banking); customer assisted (This is where an employee of the bank uses customer-assisted innovation in completing a transaction for instance the use of Customer Relationship Management (CRM) System by customer service officials to understand the profile of the customer and address the concerns of the customer with regard to banking transactions (Gutek & Welsh, 1999); and the final is customer transparent technology. This defines the actual core of bank's operations which customers never see but affects the level of service offered.

Christopher, Visit, Amy and Mike (2005) cite some of the most commonly used financial innovations by banks as internet banking, bank automation, ATMs, core banking, mobile banking, debit cards and credit cards. Other most commonly used technological innovations include agent banking, internet banking and mobile banking (Chebii, 2013). According to Kumbhar (2011) Indians have adopted various technological innovations including; ATM, POS Terminals, Core Banking Solution (CBS), internet banking, credit cards, mobile banking, debit cards just to mention a

few. Sheleg and Kohali (2011) argue that the use of ATMs, telebanking, mobile banking, social media banking and online banking have been adopted by banks globally.

1.1.2 Firm Efficiency

Sandrine (2010) defines bank efficiency as being related to the ability to produce a desired outcome using minimum effort or resources. It ascertains the extent to which a production unit gets close to its production possibility frontier, which constitutes the points that optimally combine inputs so as to produce one output unit. Floros and Giordani (2008) say that efficiency is considered as a relative measure that shows the deviations from the expected output using a given set of input. According to Kalluru and Bhat (2009), efficiency is the firm's ability to minimize waste and maximize resource capabilities so as to deliver quality products and services to the clients (Kalluru & Bhat, 2009). It involves the identification of wasteful resources and processes that affects productivity and growth of organizations profits. The main concern of efficiency is redesigning new work processes that improve productivity and quality (Darrab & Khan, 2010). Charnes, Rhodes and Coopers (1978) defines operational efficiency as the ratio of weighted outputs to the weighted inputs.

The real measurement of efficiency is ratio of the actual productivity to the maximum productivity that can be attained. The highest possible attainable productivity is described as the desired productivity. According to Hackman (2008), the process of analyzing productivity and efficiency is linked with economies of production which answers basic question such as what is the firm's efficiency in the utilization resources during the production process and its efficiency during scaling operations.

There are several ratios of measuring efficiency. To begin with, we can use the total asset turnover ratio which measures the ability of the company to produce sales considering its investment in total assets. The formula for the ratio is dividing net sales by average total assets. Secondly we can use the fixed-asset turnover ratio which is analogous to total asset turnover ratio except that the only factor taken into account is the fixed assets turnover. Fixed-asset turnover is derived by dividing net sales by average net fixed assets. Another ratio for measuring efficiency is operating ratio which shows the efficiency of a company's management through comparison of the operating expense and net sales. The smaller the ratio, the greater the ability to generate of the organisation profits (Rao & Lakew, 2012). The current study will use the ratio of total revenue to total operating expenses that measures the number of times that revenues covers expenses will be used in this study.

1.1.3 Financial Innovations and Efficiency

The banking industry has been tremendously influenced by technological advancements just like the other aspects of life. The emergence of e-banking has significantly redefined and transformed banks' operations (Kolodinsky, Hogarth & Hilgert, 2004). Technology is viewed as the major driving force in firms' performance success. All banks irrespective of whether local or foreign are investing heavily on emerging technologies that assure customer satisfaction in e-banking. Technologies such as mobile banking, electronic funds transfer (EFT), PC banking, online bills payments, online statements, account to account transfer, ATMs and credit cards, and account to account transfer are the banks major services.

With reference to Harker and Zenios (2000), it's stated that technological advancement encourages more competitive force. Primarily, it opens up new

conveyance channels, keeping in mind that those are not more cost effective for the organization; hence customers get the chance to rely on upon them and demand access. Nevertheless, before the bank branch was the main channel for the dispersion of financial services, we see today an assortment of channels eroding the branch's dominance. The economies of scale that lead to more incorporated automation cause more economies of scope effects. As financial establishments – in concurrence with all other retail services – understand that consumer satisfaction and loyalty lead to a fixed progression, they go for increasing the share of customers' wallets that they are servicing. With stage automation, a representative can get a single view of the whole customer relationship; economies of scope can be made when a firm offers appropriate product mix to support its customer base.

Gale and Allan (1994) opposed advancement to remain noticed by means of: presentation of original economic devices and/or services and/or repetition, launching of original fund expenditures, discovering new wellsprings of funds, launching of original developments and/or methods towards handling everyday processes, and/or setting up an innovative organization; with every one of respective modifications to be a piece of present economic organizations, rise of remarkable development of innovative economic organizations and marketplaces. Financial advancement refers to making before promoting innovative economic devices, also inclusive of first-hand economic know-hows, organizations and marketplaces (Lerner & Tufano, 2011). The advancements are in some cases separated into products and/or procedure variations, through merchandise advancements demonstrated through innovative unoriginal agreements, innovative commercial securities, or first-hand types of joint speculation goods, plus processes enhancements characterized via first-hand ways for disseminating securities, handling dealings, and/or valuing trades.

1.1.4 Commercial Banks in Kenya

Currently, in Kenya the licensed commercial banks number is 42 and there is one mortgage finance company. Private investors own 39 commercial banks and the mortgage finance institution whereas the remaining 3 commercial banks are the only banks which Kenya Government holds a controlling ownership. Out of the 39 banks which are owned by private investors and 1 mortgage finance, 25 are locally owned (i.e. Kenyan citizens are their major shareholders) while 14 have alien ownership. The rest of the local commercial banks are largely family owned (CBK, 2016).

In the 21st century, banking is considered as innovative banking. The banking philosophy has completely been transformed by technological changes along with many financial innovations which has heightened the competitiveness of Kenya's banking industry. The banking system operates under an environment experiencing huge dynamism and challenges which has necessitated for new product, process and market innovations. The application of information technology has yielded new innovations in product designing and changed their mode of delivery in the banking and finance sectors. Several initiatives are being undertaken in the banking sector to offer better customer services with the aid of new technologies. Financial innovation has been employed as a strategic resource for attainment of higher efficiency, reduction of cost and control of operations through replacement of labor intensive and paper based methods with automated processes thus leading to higher profitability and productivity (Ocharo & Muturi, 2016).

Efficiency in the sector will ensure commercial bank's the shareholders get a return to their investment which triggers more investment thus increased economic growth. Poor performance on the other hand by banks will lead to failure of financial market

which may cause a financial crisis that hinders economic growth. Although there is a general register of good performance among commercial banks in Kenya, several are not doing well financially (Oloo, 2011). The industry's reforms such as agency banking, implementation of e-commerce in the payment systems, operationalization of credit reference bureaus, activation of horizontal repos and implementation of the Microfinance Act and will enhance the sectors growth and development (Adembesa, 2014).

1.2 Research Problem

A key assumption of most research work done on the improvement of operations has been financial innovations are directly proportional to improvements in efficiency (Upton & Kim, 1999). The process of financial innovation and implementation forms a critical part in the growth of many nations. A change of past techniques and adoption of local technology similar to that of more advanced industrialized nations lead to indigenous financial innovations (Roehm & Sternthal, 2001). The advancement in technology has made some tasks more efficient and cheaper but it also has its fair share of challenges (Aladwani, 2001). This has seen firms in the banking sector use technology to develop financial innovations to reduce costs and enhance efficiency and convenience but still fail (Kombe & Wafula, 2015). This study entails a review of the effect of financial innovations on efficiency of banks.

Kenyan banks have embraced ATMs, POS, mobile banking, internet banking, agency banking and card business. Financial innovations are being used as a tool to cut cost, increase efficiency, deliver product varieties, and increase flexibility or for the mere purpose of being perceived as technology leader (Pyun, Scruggs & Nam, 2002). Today, bank customers' enjoy efficient, convenient and fast banking services

conveyed through technological innovations such as Mobile banking, online banking and ATMS. The practical and managerial problem that this study intends to solve originates from the perspective that technological innovations are risky ventures associated with failure, exposure inform of litigations and increased fraud and may therefore have a significant negative or positive effect on bank efficiency depending on how they are handled.

Several empirical studies have been conducted in this area on the international context. Studies by Singh and Pooja (2009) concluded that innovation had an insignificant effect on the bank's performance, while Mwania and Muganda (2011) and Batiz-Lazo and Woldesenbet (2006) argued that financial innovation significantly influenced bank performance. Venansius (2014) researched on utilization of technology to improve on service. He reasons that innovation is an instrument that ought to be abused to upgrade service conveyance in institutions that provide access to monetary services. It makes an upper hand as well as improves business development and steadiness. Stoica, Mehdian and Sargu (2015) did a research on how internet banking impacts on the performance of Romanian banks and concluded that e-banking provides efficient and lower cost services which increase banks' performance.

Locally, Kimani (2015) did a study on effects of adoption of mobile banking on commercial banks operational efficiency. It was established that a correlation exists between growth in mobile banking and growth in banking efficiency. Mulwa (2017) studied the effect of internet -banking on financial performance of commercial banks in Kenya and found that the internet banking had a positive and significant influence on financial performance of commercial banks as measured by return on assets.

Muchiri (2017) carried out a study to ascertain the impact of strategic alternative banking channels on the commercial banks' profitability in Kenya and found that strategic alternative banking channels impacts positively on customer deposits, transactional volumes and profitability of commercial banks in Kenya. Kalela (2017) conducted a study to determine the uptake of alternative banking channels and its influence on operational performance of commercial banks in Kenya. The results demonstrated a positive and significant association between banks' performance in terms of cost to income ratio and uptake of both agency banking and mobile banking.

The reviewed studies in the Kenyan context have mostly focused on the effect of selected financial innovations on financial performance of commercial banks and therefore leaving a gap on the effect of financial innovations on efficiency of commercial banks in Kenya. The current study intended to fill this research gap by investigating the effect of financial innovations on efficiency of commercial banks in Kenya. The technological innovations to be covered include internet banking, agency banking, mobile banking and ATMs. The study intended to answer the following the research question; what is the effect of financial innovations on efficiency of commercial banks in Kenya?

1.3 Objective of the Study

The objective of this study was to determine the effect of financial innovations on efficiency of commercial banks in Kenya.

1.4 Value of the Study

The results of the research are of great importance to the future researchers, since it can be a point of reference. The findings might also be significant to scholars and

researchers, in identifying the research gaps on the related topics of the study as well as reviewing of the empirical literature to institute further areas of research.

The study is timely and will generate information that will be useful to a number of groups of stakeholder in the banking industry, including the management, regulatory authorities and researchers in the banking sector. The management of commercial banks will find the report useful in identifying how they can use financial innovations to increase efficiency of their respective banks.

To the government and other policy makers, this study will be beneficial in aiding the formulation of policies and procedures that would steer commercial banks and other banks in the sector adopt financial innovations that would improve their efficiency which in turn will contribute to the sector performance.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The chapter reviews theories that form the foundation of this study. In addition, previous empirical studies that have been carried before on this research topic and related areas are also discussed. The other sections of this chapter include determinants of efficiency, conceptual framework showing the relationship between study variables and a literature review summary.

2.2 Theoretical Framework

This presents review of the relevant theories that explains the relationship between financial innovations and efficiency. The theoretical reviews covered are technology acceptance model, financial intermediation theory and diffusion of innovation theory.

2.2.1 Technology Acceptance Model

Technology Acceptance Model (TAM) as developed by Davis (1989) clarifies the way clients embrace/acknowledge and utilize an innovation. This model asserts that once a client is given an alternative innovation, some aspects influence their choices on the means and time of utilization. This incorporates its apparent convenience and seen helpfulness. TAM embraces settled causal chain of genuine conduct convictions, goal and disposition. This was produced by social clinicians from the hypothesis of contemplated activity. In Davis' study, two vital parts are recognized; seen convenience and seen helpfulness (Davis, Toxall & Pallister, 2002).

In other studies regarding technology, TAM is widely adopted and greatly contributes to the development of a prediction of an individual’s usage of technology (Fishbein & Ajzen, 2010). Perceived ease of use influences the perceived usefulness and the

intention for adoption (Davis, 1989). Despite TAM being an important source for theoretical framework in the study of adoption and use of technology it has many limitations which include the initial purpose designing the model which is parsimony and generality (Dishaw & Strong, 1999), not taking into consideration non-organizational setting of the organization (Davis & Venkatesh 2000), and ignoring the factors which moderate the adoption of ICT (Sun & Zhang, 2006). This theory has affected research in acceptance of technology. In this exploration, TAM will be utilized to discover how the utilization of technology enhances financial performance of commercial banks in Kenya and how the accessibility of technology impacts the utilization of financial innovations among commercial banks in Kenya.

2.2.2 Financial Intermediation Theory

The financial intermediation theory was advanced by Mises (1912) and postulates that that financial institutions especially banks play a significant role in financial intermediation. The banks play the role of mobilizing customers with surplus money and availing them for lending to those with a shortage at a cost commonly referred to as interest. This association allows the banks to create a state of liquidity since money is taken from customers with short term maturity funds and lend to customers with long term maturity basis (Dewatripont, Tirole & Rochet, 2010). Mises (1912) argues that the banks' role as credit negotiators is characterized by lending borrowed money.

Financial intermediation through borrowing and lending money can thus be described as the key role of the banks. According to Mises (1912), involvement in financial intermediation by banks denies them the role of creating money while retreating from the process presents them with a chance to create money. However Allen and Santomero (2001) criticize the theory on grounds that it perceives risk management as

an emerging factor in the financial sector and puts the concept of participation costs at the front line. This theory is applicable to the study since bank performance could be enhanced by improving customer deposits through development of channels that will facilitate easy and convenient undertaking of bank transactions by the customers.

2.2.3 Diffusion of Innovation Theory

According to Mahajan and Peterson (1985), an innovation is any idea, practice or object that is that is introduced into a social system for the first time whereas diffusion of innovation is the process through which the innovation is conveyed through specific channels over a period of time within a social system. In this context, diffusion of innovation theory seeks to describe the manner in which new inventions such as mobile banking and internet are adopted and used within a social system (Clarke 1995).

According to Sevcik (2004), the innovation adoption process is not instant but takes time. He further argues that diffusion of innovation is influenced by resistance to change since it slows down the innovation adoption process. Innovation adoption process is influenced by five major attributes namely relative advantage, compatibility, complexity, observability and triability (Rogers 1995). Rogers argues that the level of new innovations adoption depends on the manner in which new organization perceives its relative advantage, triability, compatibility, complexity and observability. If a Kenyan organization observes the benefits of alternative banking channels, then these innovations will be adopted when other prerequisite tools are available. Innovation adoption is faster in organizations with information technology departments and internet access as opposed to those without.

2.3 Determinants of Firm Efficiency

The efficiency of firms can be influenced by elements either external or internal to the firms that define the level of output. The internal factors are different for each firm and determine its efficiency. These factors result from managerial decisions together with the board. The internal factors include innovations, capital structure, firm size, liquidity, management efficiency, capital, market power among others. External factors are not within the control of management. They are factors that the firm does not have control over them but rather they need to develop strategies to deal with them (Athanasoglou, Brissimis, & Delis, 2005).

2.3.1 Internet Banking

According to Essinger (1999), internet banking is defined as the undertaking of bank transactions or access to bank accounts via bank websites. It entails the use of telecommunication networks and devices to avail several services and products to customers in order to serve all the potential customers. Munyoki (2013) purports that internet banking serves well in attracting and retaining customers. Internet banking also facilitates penetration into new market and improvement of service quality. Therefore, the bank's performance is significantly influenced by internet banking.

There has been increased application of internet banking by bankers, participants in the financial services' sector, regulators, law and policy makers. This is associated with its perceived benefits such as increase bank revenue, increased flexible in banking and reduction of costs. Others are also interested with internet banking for policy developments. Studies by Karen et al., (2010) cite the existence of inadequate literature on internet banking which has seen continued use speculations when addressing internet banking issues. Internet banking reduce staffing levels, cuts the

bank's costs, increase banking convenience and increase commission income this increasing the profitability of the bank. When compared with other banking services, internet banking is rated the best since it offers customers with flexibility and total control (Essinger, 1999).

2.3.2 Mobile Banking

This involves the use of mobile devices to avail banking services such as account transactions for instance checking of account balances and transacting with stock market accounts. According to Porteous (2006), mobile banking allows customers to order cheque book, access their account balance, receive debits and credit alerts, do funds transfer, pay bills from their phones, receive minimum balance alerts and check information including exchange rates and interest rates.

According to Porteus (2006) mobile banking has seen a tremendous growth in both financial service and global banking sectors. This is due to the benefits of mobile banking such as reaching out to a larger customer base and reduction of overall operational costs. The increased adoption of mobile banking has been accelerated by increased demand for convenience by account holders and increased mobile phones adoption. Mobile banking is highly beneficial to the customers since it saves on time and increase convenience while banks have benefited through elimination of barriers that deterred the access to financial services by the customers (Mburu 2013).

2.3.3 Agency Banking

Agency banking is where banks form partnerships with shops, construction companies, pharmacies and other retail outlets for easy delivery of financial services by the bank (Kumar, 2006). Mwangi (2011) opines that the selection criteria on these different aspects including their network connectivity, services delivered, ability to

execute anti money laundering procedures, financial projections and particular business strategy. The use of bank retail agents may be more efficient and convenient than allowing potential holders and actual account holders to physically visit bank branches thus enhancing financial inclusion (market access) (Lyman, Ivatury & Staschen, 2006). This will expand the banks market leading to increased profits.

As Ndungu and Wako (2015) explain, agency banking was seen to have given another revenue generating avenue to the banks through the deposits and withdrawals by customers, which ultimately increase the profitability of the banks. Studying on how agency banking contributes to financial performance of banks, Njagi (2013) found that aspects such as low costs for the transactions, banks regulation of the agents, and quick access to financial services impacted positively on the performance of the banks on the financial dimension across the Kenyan nation.

2.3.4 Bank Size

Bank size determines the extent to which a firm is affected by legal and financial factors. The size of the bank is also closely linked with the capital adequacy because large banks raise less expensive capital and thus generate huge profits. Bank size has a positive correlation with the return on assets indicating that large banks can achieve economies of scales that reduce operational cost and hence help banks to improve their financial performance (Amato & Burson, 2007). Magweva and Marime (2016) link bank size to capital rations claiming that they are positively related to each other suggesting that as the size increases profitability rises.

The amount of assets owned by an organization determine it size (Amato & Burson, 2007). It is argued that large firms have adequate resources to undertake a number of large projects with better returns than firms with small amounts of total assets. In

addition, firms with large amounts of total assets have adequate collateral which they can pledge to access credit and other debt facilities compared to their smaller counterparts (Njoroge, 2014). Lee (2009) established that the total assets controlled by a firm as measured by the total assets have an influence on the level of profitability recorded from one year to another.

2.3.5 Bank Liquidity

Liquidity is defined as the degree in which an entity is able to honor debt obligations falling due in the next twelve months through cash or cash equivalents for example assets that are short term can be quickly converted into cash. Liquidity results from the managers' ability to fulfill their commitments that fall due to creditors without having to liquidate financial assets (Adam & Buckle, 2003).

According to Liargovas and Skandalis (2008), liquid assets can be used by firms for purposes of financing their activities and investments in instances where the external finance is not forthcoming. Firms with higher liquidity are able to deal with unexpected or unforeseen contingencies as well as cope with its obligations that fall. Almajali et al., (2012) noted that firm's liquidity may have high impact on efficiency of firms; therefore firms should aim at increasing their current assets while decreasing their current liabilities as per his recommendation. However, Jovanovic (1982) noted that an abundance of liquidity may at times result to more harm.

2.3.6 Management Efficiency

Management efficiency is a key internal factor that qualitatively measures and determines the operational efficiency of a firm. The ability of the management to efficiently utilize the resources of the firm, their ability to maximize funding and their

ability to efficiently allocate those funds are some of the ways of assessing the management efficiency (Kusa & Ongore, 2013).

Management efficiency is a qualitative measure and determinant of operational efficiency and it can be assessed by looking at the quality of the staff, the effectives and efficiency of the internal controls, the discipline within the organization and the effectiveness of the management systems (Athanasoglou, Sophocles & Matthaois, 2009). The quality of the management has an influence on the level of operating expenses which affects the bottom line of a firm hence management efficiency significantly affects the efficiency of firms (Kusa & Ongore, 2013).

2.3.7 Capital Adequacy

According to Athanasoglou et al., (2005), capital is a significant variable in determining bank financial performance. Capital is the owner's contribution which supports the bank's activities and acts as a buffer against negative occurrence. In capital markets that are not perfect, well-capitalized banks must reduce borrowing so as to support a certain index of assets, and as a result of lower prospective bankruptcy costs they tend to face lower funding costs.

A well-capitalized bank has a signaling effect to the market that a performance above average is to be expected. Athanasoglou et al., (2005) realized that capital contributions positively affected bank profitability, which reflects sound financial condition of banks in Greece. Also, Berger et al., (1987) noted positive causality in both direction between capital contributions and profitability in companies.

2.4 Empirical Review

Studies have been conducted both locally and internationally to support the relationship between technological innovations and financial performance, but these studies have produced mixed results.

2.4.1 Global Studies

Malhotra and Singh (2009) undertook a study on the impact of internet banking on risk and bank performance and concluded that internet banks are larger, more operationally efficient and more profitable. The findings further revealed that internet banks are better managed and have higher asset quality which lowers building and equipment expenses. The findings also show that Indian internet banks purely rely on deposits and adoption of internet banking by smaller banks has resulted in significant reduction in profitability.

A study by Mohammad and Saad (2011) on the impact of electronic banking on the performance of Jordanian banks over the period (2000- 2010) concluded that electronic banking negatively affects banks' performance which was akin to the findings of Delgado, Hernando and Nieto (2007) and Siam (2006). Electronic banking adoption impacts on a bank's risk profile. The risk management principles issued by Basel Committee in July 2003 for electronic banking recognize the related risk factors and the committee's aim was to promote and enhance safety of services provided by online banking while observing flexibility in line with emerging technologies as a result of the turbulent environment.

Tchouassi (2012) used empirical studies from selected Sub –Saharan Countries to establish whether mobile phones actually contribute in extending banking services to the unbanked. The aim of the study was to find how mobile phones could be used to

the unbanked and poor segment of the population. The findings revealed that poor and vulnerable households in Sub-Saharan Africa (SSA) countries are often incur high financial transactions while undertaking basic financial transactions. Therefore, the use of mobile phone could improve the provision of financial services in this segment and that economic and technological innovation, regulatory and policy innovation was required to extend this services.

A survey by Kumbhar (2011) examined alternative banking channels and customers' satisfaction among Indian private and government banks. The major factors related to customer satisfaction with respect to alternative banking were observed in the two sectors. These entailed education, age, bank customers profession, brand perception, perceived value and service quality. The likert scale based questionnaires were used for data collection. The study established that quality of service, perceived value and brand perception and have a positive association with customer satisfaction. However a strong association existed between alternative banking and customer satisfaction. It was concluded from the study that facts should be considered by banks so as to enhance service quality of alternative banking services thus leading to increased customer satisfaction.

Wadhe and Saluja (2015) explored the impact of E-banking on profitability of commercial banks in India as from the time frame 2006 and 2014. For the purposes of the study, 31 commercial banks under the four major Indian bank groups were sampled. The impact of E-banking services on the commercial banks' profitability was tested using the multiple regression analysis. The findings depicted a positive association between e-banking and both private and public sector commercial banks' profitability. The study recommended that the banks should increase the number of

ATMs so as to realize increased profitability. However, a negligible association existed between number of branches and the banks' profitability.

2.4.2 Local Studies

Munyoki (2013) explored the impact of online banking on the financial performance of the 43 commercial banks in Kenya. The study employed the descriptive research design. Structured questionnaires were used to collect primary data while CBK annual reports were used to extract secondary data. It was established from the study a negligible positive association exists between online banking and Kenyan financial banks financial performance. The association was to linked to the fact that online banking increase commission income, cuts on costs, increase convenience in banking and reduce staffing levels. The study recommended that security concerns should be addressed by the banks to curb the increases cases of online banking fraud.

A study by Ndungu (2015) examined the effect of alternative banking channels on the performance of Kenyan financial institutions. The study employed the descriptive research design. The secondary data used for the study were retrieved from the CBK annual reports. It was established from the study that alternative banking channels such as agency banking, mobile banking, operating expenses and customer deposits are responsible for 73.4% change in the financial performance of the Kenyan commercial banks. The study established that mobile banking adoption had declined as from 2012. It was recommended that in order to enhance alternative banking, more alternative banking channels and innovations should be adopted by Kenyan commercial banks.

Gichungu and Oloko (2015) examined the influence of innovative technology having on commercial institutions' performance in the country. The goal of the study was to

investigate effect of ATM banking, mobile phone banking and other platforms currently being used by people to do banking such as online banking as well as agency banking on the Kenyan financial banks' performance using all the 43 commercial banks in Kenya as the Sample. By use of multiple linear regression to analyze the data the study concluded that the sampled banks' financial performance was significantly and positively influenced by these banking platforms between the time frame 2009 and 2013.

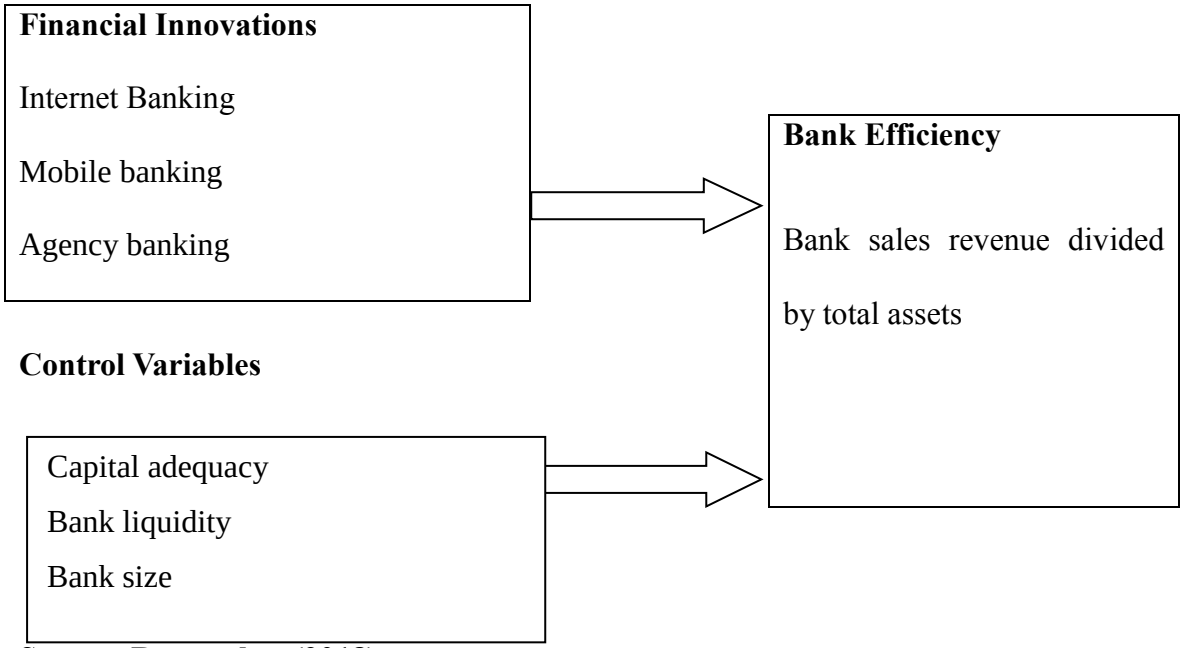
Mwiti (2016) explored the effects of alternative banking channels on the financial performance of Kenyan commercial banks. The study used six year (2011-2015) data for analysis. Regression analysis was used find out the effect of alternative banking channels on the financial performance of commercial banks in Kenya. The study indicated that a strong association exists between alternative banking channels and Kenyan commercial banks' financial performance. The study further established that mobile banking, ATMs banking, internet banking and agency banking positively influence financial performance of the commercial banks and in a statistically significant way.

2.5 Conceptual Framework

The conceptual model developed below portrays the expected relationship between the study variables. Independent variables was financial innovations as characterized by mobile banking as measured by natural logarithm of the value of mobile banking transactions per year, internet banking given as natural logarithm of the value of internet banking transactions per year and agency banking given by natural logarithm of the value of agency banking transactions per. The control variables were capital adequacy, liquidity and bank size. Bank efficiency was the dependent variable that the

study sought to explain and it was measured by bank sales revenue divided by total assets.

Figure 2.1: The Conceptual Model



Source: Researcher (2018)

2.6 Summary of the Literature Review

A number of theoretical frameworks have explained the theoretically expected relationship between financial innovations and efficiency of banks. The theories covered in this review are; technology acceptance model, financial intermediation theory and diffusion of innovation theory. Some of the key influencers of firm efficiency have also been explored in this section. A number of empirical studies have been conducted both internationally and locally on financial innovations and efficiency of firms. The findings of these studies have also been explored in this chapter.

The lack of consensus among international studies on the effect of financial innovations on efficiency of commercial banks is an enough reason to conduct further studies. The reviewed studies in the Kenyan context have either failed to show how the Kenyan commercial bank's efficiency is affected by financial innovations or consider financial performance as the dependent variable. The current study intends to fill this research gap by investigating the effect of financial innovations on efficiency of commercial banks in Kenya.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

In order to determine the effect of financial innovations on efficiency of commercial banks, a research methodology is necessary to outline how the research was carried out. This chapter has four sections namely; research design, data collection, diagnostic tests and data analysis.

3.2 Research Design

A descriptive cross-sectional research design was employed in this study to investigate the relationship between financial innovations and efficiency of commercial banks. Descriptive design was utilized as the researcher is interested in finding out the state of affairs as they exist (Khan, 2008). This research design was appropriate for the study as the researcher is familiar with the phenomenon under investigation but want to know more in terms of the nature of relationships between the study variables. In addition, a descriptive research aims at providing a valid and accurate representation of the study variables and this helps in responding to the research question (Cooper & Schindler, 2008).

3.3 Population

This refers to all observations of interest in an entire collection like people or events as described by a researcher (Burns & Burns, 2008). This study's population comprised of the 42 commercial banks operating in Kenya as at 31/12/2017. Since the population is finite, a census of the 42 banks was undertaken for the study (see appendix one).

3.4 Data Collection

Secondary data was obtained solely from the published annual financial reports of the commercial banks operating in Kenya between January 2012 and December 2017 and captured in a data collection sheet. The reports were obtained from the central bank website and banks annual reports. The end result was annual information detailing the independent variables and dependent variable for the 42 commercial banks in Kenya.

3.5 Diagnostic Tests

Linearity show that two variables X and Y are related by a mathematical equation Y=bX where c is a constant number. The linearity test was obtained through the scatterplot testing or F-statistic in ANOVA. Stationarity test is a process where the statistical properties such as mean, variance and autocorrelation structure do not change with time. Stationarity was obtained from the run sequence plot. Normality is a test for the assumption that the residual of the response variable are normally distributed around the mean. This will be determined by Shapiro-walk test or Kolmogorov-Smirnov test. Autocorrelation is the measurement of the similarity between a certain time series and a lagged value of the same time series over successive time intervals. It was tested using Durbin-Watson statistic (Khan, 2008).

Multicollinearity is said to occur when there is a nearly exact or exact linear relation among two or more of the independent variables. This was tested by the determinant of the correlation matrices, which varies from zero to one. Orthogonal independent variable is an indication that the determinant is one while it is zero if there is a complete linear dependence between them and as it approaches to zero then the multicollinearity becomes more intense. Variance Inflation Factors (VIF) and

tolerance levels were also carried out to show the degree of multicollinearity (Burns & Burns, 2008).

3.6 Data Analysis

The SPSS software version 21 was used in the analysis of the data. The researcher quantitatively presents the findings using graphs and tables. Descriptive statistics were used to summarize and explain the study variables as observed in the banks. The results were presented using frequencies, percentages, measures of central tendencies and dispersion displayed in tables. Inferential statistics included Pearson correlation, multiple regressions, ANOVA and coefficient of determination.

3.6.1 Analytical Model

The regression model below was used:

$$Y= \alpha+ \beta_1X_1+\beta_2X_2+\beta_3X_3+ \beta_4X_4 +\varepsilon.$$

Where: Y = Efficiency of commercial banks as measured by the ratio of a bank's sales revenue divided by total assets on an annual basis

α =y intercept of the regression equation.

β_1, β_2, β_3, β_4 =are the slope of the regression

X_1 = Financial innovations as measured by natural logarithm of the value of internet banking, mobile banking and agency banking transactions per year

X_2= Capital adequacy as measured by ratio of core capital to total customer deposits on an annual basis

X_3= Bank size as measured by natural logarithm of total assets on an annual basis

X_4=Bank liquidity as measured by ratio of liquid assets to total customer deposits on an annual basis

ε =error term

3.6.2 Tests of Significance

The researcher carried out parametric tests to establish the statistical significance of both the overall model and individual parameters. The F-test was used to determine the significance of the overall model and it was obtained from Analysis of Variance (ANOVA) while a t-test was used to establish statistical significance of individual variables.

CHAPTER FOUR: DATA ANALYSIS, FINDINGS AND INTERPRETATION

4.1 Introduction

The chapter focused on the analysis of the collected data to establish the influence of financial innovations on efficiency of the Kenyan commercial banks. Using descriptive statistics, correlation analysis and regression analysis, the results of the study were presented in table forms as shown in the following sections.

4.2 Diagnostic Tests

The researcher carried out diagnostic tests on the collected data. The research assumed a 95 percent confidence interval or 5 percent significance level (both leading to identical conclusions) for the data used. These values helped to verify the truth or the falsity of the data. Thus, the closer to 100 percent the confidence interval (and thus, the closer to 0 percent the significance level), the higher the accuracy of the data used and analyzed is assumed to be. To test for normality, the null hypothesis for the test was that the secondary data was not normal. If the p-value recorded was more than 0.05, the researcher would reject it.

"A test of Multicollinearity was undertaken. Tolerance of the variable and the VIF value were used where values more than 0.2 for Tolerance and values less than 10 for VIF meaning that Multicollinearity doesn't exist. Multiple regressions is applicable if strong relationship among variables doesn't exist. From the findings, all the variables had tolerance values >0.2 and VIF values <10 as shown in table 4.1 showing that Multicollinearity among the independent variables doesn't exist".

Table 4.1: Multicollinearity Test for Tolerance and VIF

	Collinearity Statistics	
Variable	**Tolerance**	**VIF**
Financial innovations	0.646	1.434
Capital adequacy	0.398	1.982
Bank liquidity	0.360	1.382
Bank size	0.392	1.463

Source: Research Findings (2018)

Shapiro-wilk test and Kolmogorov-Smirnov test was used to test for normality. The null hypothesis for the test was that the secondary data was not normal. If the p-value recorded was more than 0.05, the researcher would reject it. The results of the test are as shown below

Table 4.2: Normality Test

Efficiency	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Financial innovations	.173	205	.300	.918	205	.822
Capital adequacy	.180	205	.300	.894	205	.790
Bank liquidity	.176	205	.300	.892	205	.784
Bank size	.181	205	.300	.896	205	.792
a. Lilliefors Significance Correction						

Source: Research Findings (2018)

"Both Kolmogorov-Smirnova and Shapiro-Wilk tests recorded o-values greater than 0.05 which implies that the research data was normally distributed and therefore the null hypothesis was rejected. The data was therefore appropriate for use to conduct parametric tests such as Pearson's correlation, regression analysis and analysis of variance".

"Autocorrelation tests were run in order to check for correlation of error terms across time periods. Autocorrelation was tested using the Durbin Watson test. A durbin-watson statistic of 1.933 indicated that the variable residuals were not serially correlated since the value was within the acceptable range of between 1.5 and 2.5".

Table 4.3: Autocorrelation Test

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.415[a]	.172	.156	.068840	1.933

a. Predictors: (Constant), Bank Size, Financial innovations, Liquidity, Capital adequacy

b. Dependent Variable: Efficiency

Source: Research Findings (2018)

4.4 Descriptive Analysis

Descriptive statistics gives a presentation of the average, maximum and minimum values of variables applied together with their standard deviations in this study. Table 4.4 shows the descriptive statistics for the variables applied in the study. An analysis of all the variables was acquired using SPSS software for the period of five years (2013 to 2017) for all the 41 banks that provided data for this study. The mean,

standard deviation, minimum and maximum for all the variables selected for this study are as shown in the table below.

Table 4.4: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Efficiency	205	.079	.480	.21323	.074914
Financial innovations	205	7.261	9.768	8.76122	.890766
Capital adequacy	205	.025	.969	.46090	.217898
Liquidity	205	.140	.948	.38181	.129532
Bank Size	205	6.794	8.703	7.68560	.534062
Valid N (listwise)	205				

Source: Research Findings (2018)

4.5 Correlation Analysis

The association between any two variables used in the study is established using correlation analysis. This relationship ranges between (-) strong negative correlation and (+) perfect positive correlation. Pearson correlation was employed to analyze the level of association between the commercial banks' efficiency and the independent variables for this study (financial innovations, bank liquidity, bank size and capital adequacy).

The study found out that liquidity and bank size have a positive and statistically significant correlation with the commercial banks' efficiency as shown by (r =. 389, p = .000; and r = .172, p = .013) respectively. Financial innovations and capital adequacy were found to have a positive but insignificant correlation with efficiency.

Table 4.5: Correlation Analysis

		Efficiency	Financial innovations	Capital adequacy	Liquidity	Bank Size
Efficiency	Pearson Correlation	1	.002	.037	.389**	.172*
	Sig. (2-tailed)		.982	.603	.000	.013
Financial innovations	Pearson Correlation	.002	1	.212**	.009	-.020
	Sig. (2-tailed)	.982		.002	.895	.771
Capital adequacy	Pearson Correlation	.037	.212**	1	-.117	.032
	Sig. (2-tailed)	.603	.002		.095	.644
Liquidity	Pearson Correlation	.389**	.009	-.117	1	.138*
	Sig. (2-tailed)	.000	.895	.095		.048
Bank Size	Pearson Correlation	.172*	-.020	.032	.138*	1
	Sig. (2-tailed)	.013	.771	.644	.048	

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

c. Listwise N=205

Source: Research Findings (2018)

4.6 Regression Analysis

Efficiency was regressed against four predictor variables; financial innovations, bank liquidity, bank size and bank capital adequacy. The regression analysis was executed at a significance level of 5%. The critical value obtained from the F – table was measured against the one acquired from the regression analysis.

The study obtained the model summary statistics as shown in table 4.6 below.

Table 4.6: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.415[a]	.172	.156	.068840	1.933

a. Predictors: (Constant), Bank Size, Financial innovations, Liquidity, Capital adequacy

b. Dependent Variable: Efficiency

Source: Research Findings (2018)

R squared, being the coefficient of determination shows the deviations in the response variable that's as a result of changes in the predictor variables. From the outcome in table 4.6 above, the value of R square was 0.172, a discovery that 17.2 percent of the deviations in efficiency of commercial banks is caused by changes in financial innovations, bank liquidity, bank size and bank capital adequacy. Other variables not included in the model justify for 82.8 percent of the variations in efficiency of the Kenyan commercial banks. Also, the results revealed that there exists a weak relationship among the selected independent variables and the efficiency as shown by the correlation coefficient (R) equal to 0.415. "A durbin-watson statistic of 1.933

indicated that the variable residuals were not serially correlated since the value was more than 1.5".

Table 4.7: Analysis of Variance

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.197	4	.049	10.397	.000[b]
	Residual	.948	200	.005		
	Total	1.145	204			

a. Dependent Variable: Efficiency

b. Predictors: (Constant), Bank Size, Financial innovations, Liquidity, Capital adequacy

Source: Research Findings (2018)

"The significance value is 0.000 which is less than p=0.05. This implies that the model was statistically significant in predicting how financial innovations, bank liquidity, bank size and bank capital adequacy affects the Kenyan commercial banks' efficiency".

Coefficients of determination were used as indicators of the direction of the association between the independent variables and the commercial banks' efficiency. The p-value under sig. column was used as an indicator of the significance of the association between the dependent and the independent variables. At 95% confidence level, a p-value of less than 0.05 was interpreted as a measure of statistical significance. As such, a p-value above 0.05 indicates that the dependent variables

have a statistically insignificant association with the independent variables. The results are indicated in table 4.5

Table 4.8: Model Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.003	.085		.030	.976
	Financial innovations	.001	.006	.017	.254	.800
	Capital adequacy	.028	.023	.081	1.220	.224
	Liquidity	.221	.038	.383	5.846	.000
	Bank Size	.016	.009	.117	1.790	.075

a. Dependent Variable: Efficiency

Source: Research Findings (2018)

From the above results, it is evident that apart from liquidity that produced positive and statistically significant values for this study, the other three independent variables produced positive but statistically insignificant values for this study (low t-values, $p > 0.05$).

The following regression equation was estimated:

$Y = 0.003 + 0.221X_1$

Where,

Y = Efficiency

X_1= Liquidity

On the estimated regression model above, the constant = 0.003 shows that if selected dependent variables (financial innovations, bank liquidity, bank size and bank capital adequacy) were rated zero, the commercial banks' efficiency would be 0.003. A unit increase in liquidity will result in an increase in efficiency by 0.221. Financial innovations, capital adequacy and bank size were found to be insignificant determiners of efficiency.

4.7 Discussion of Research Findings

"The aim of the study was to determine the association between financial innovations and efficiency of the Kenyan commercial. Financial innovation in this study was the independent variable and was measured by the natural logarithm of total value of transactions through financial innovations (mobile banking, internet banking and agency banking). The control variables were liquidity as measured by the current ratio, firm size as measured by natural logarithm of total assets and capital adequacy as measured by ratio of loans and advances to assets total per year. Efficiency was the dependent variable which the study sought to explain and it was measured by the ratio of total revenue to total assets".

"The Pearson correlation coefficients between the variables revealed that financial innovations have a positive but statistically insignificant correlation with the commercial banks' efficiency. It also revealed that a positive and significant correlation exists between bank size and liquidity with efficiency of commercial

banks. Capital adequacy exhibited a weak positive and insignificant association with efficiency of Kenyan insurance firms".

The model summary revealed that the independent variables: financial innovations, bank liquidity, bank size and bank capital adequacy explains 17.2% of changes in the dependent variable as depicted by R^2 value meaning this model doesn't include other factors that account for 82.8% of changes in the commercial banks' efficiency. The model is fit at 95% level of confidence since the F-value is 10.397. This shows that the overall multiple regression model is statistically significant and is an adequate model for predicting and explaining the influence of the selected independent variables on the Kenyan commercial banks' efficiency.

The results concur with Munyoki (2013) who explored the impact of online banking on the financial performance of the 43 commercial banks in Kenya. The study employed the descriptive research design. Structured questionnaires were used to collect primary data while CBK annual reports were used to extract secondary data. It was established from the study a negligible positive association exists between online banking and Kenyan financial banks financial performance. The association was to linked to the fact that online banking increase commission income, cuts on costs, increase convenience in banking and reduce staffing levels.

The study disagrees with Gichungu and Oloko (2015) who examined the influence of

innovative technology having on commercial institutions' performance in the country. The goal of the study was to investigate effect of ATM banking, mobile phone banking and other platforms currently being used by people to do banking such as online banking as well as agency banking on the Kenyan financial banks' performance using all the 43 commercial banks in Kenya as the Sample. By use of multiple linear regression to analyze the data the study concluded that the sampled banks' financial performance was significantly and positively influenced by these banking platforms between the time frame 2009 and 2013.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter shows the summary of research findings, the conclusions made from the results, and the recommendations for policy and practice. The chapter also discusses a few limitations encountered as well as suggestions for future research.

5.2 Summary of Findings

The aim of the study was to examine the impact of financial innovations on the Kenyan financial bank's efficiency. The independent variables for the study were financial innovations, bank liquidity, bank size and bank capital adequacy. A descriptive cross-sectional research design was employed in the study. Secondary data was obtained from CBK and SPSS software used in analyzing it. The study used annual data for 41 commercial banks covering a period of five years from January 2013 to December 2017.

"From the results of correlation analysis financial innovations was found to have a positive but statistically insignificant correlation with the commercial banks' efficiency. The study also found out that a positive and significant correlation exists between bank size and liquidity with efficiency of commercial banks while capital adequacy exhibited a weak positive and insignificant association with efficiency".

"The co-efficient of determination R-square value was 0.172 which means that about 17.2 percent of the variation in efficiency of the Kenyan commercial banks can be explained by the four selected independent variables while 82.8 percent in the variation of efficiency was associated with other factors not covered in this research.

The study also found a weak correlation between the independent variables and the commercial banks' efficiency (R=0.415). ANOVA results indicate that the F statistic was at 5% significance level with a p=0.000. Therefore the model was fit in explaining the association between the selected variables".

The regression results show that when all the independent variables selected for the study have zero value, the efficiency of commercial banks will be .003. A unit increase in liquidity will result in an increase in efficiency by 0.221. Financial innovations, capital adequacy and bank size were found to be insignificant determiners of efficiency.

5.3 Conclusion

"It can be concluded from the findings that the Kenyan commercial banks' efficiency is significantly affected by liquidity. The study therefore concludes that a unit increase in liquidity causes a significant increase in efficiency. The study found that financial innovations, capital adequacy and bank size are statistically insignificant determinants of efficiency and therefore this study concludes that these variables do not influence to a large extent the Kenyan commercial bank's efficiency".

"This study concludes that independent variables selected for this study financial innovations, bank liquidity, bank size and bank capital adequacy influence to a large extent efficiency. Thus, it can be concluded that these variables greatly influence efficiency of commercial banks as revealed by the p value in anova summary. The fact that the four independent variables explain 17.2% of changes in efficiency imply that the variables not included in the model explain 82.8% of changes in Kenyan commercial banks' efficiency".

Results agree with Munyoki (2013) explored the impact of online banking on the financial performance of the 43 commercial banks in Kenya. The study employed the descriptive research design. Structured questionnaires were used to collect primary data while CBK annual reports were used to extract secondary data. It was established from the study a negligible positive association exists between online banking and Kenyan financial banks financial performance. The association was linked to the fact that online banking increase commission income, cuts on costs, increase convenience in banking and reduce staffing levels.

5.4 Recommendations

The study established that financial innovations have a positive but insignificant influence on efficiency. Thus the study wishes to make the following recommendations for policy change: Commercial banks in Kenya should invest heavily in financial innovations since this will cause improvement in the efficiency of the banks. The Kenyan Government through the Central bank should come up with policies that generate a conducive environment for commercial banks to operate in since it will translate to economic growth of the country.

The study found out that a positive relationship exists between efficiency and bank liquidity. This study recommends that a comprehensive assessment of a firm's immediate liquidity position should be undertaken to ensure that banks are operating at the required levels of liquidity as bank's liquidity has been found to be a significant determiner of efficiency.

The study concluded that there is positive relationship between efficiency and size of a bank. This study recommends that banks' management and directors should aim at increasing their asset base by coming up with measures and policies aimed at

enlarging the banks' assets as this will eventually have a direct influence on efficiency of the bank. From the findings of this study, big banks in terms of asset base are expected to be more efficient than small banks and therefore banks should strive to grow their asset base.

5.5 Limitations of the Study

"The scope of this research was for five years 2013-2017. It has not been determined if the results would hold for a longer study period. Furthermore it is uncertain whether similar findings would result beyond 2017. A longer study period is more reliable as it will take into account major economic conditions such as booms and recessions".

"Data quality is one of the study limitations. From this research, it is hard to conclude whether the results present the true facts about the situation. Data that has been used is only assumed to be accurate. There is also a great inconsistency in the measures used depending on the prevailing conditions. Secondary data was employed in the study which was already in existent as opposed to primary data which was raw information. The study also considered selected determinants of and not all the factors affecting efficiency of commercial banks mainly due to limitation of data availability".

For data analysis purposes, the researcher applied a multiple linear regression model. Due to the shortcomings involved when using regression models such as erroneous and misleading results when the variable values change, the researcher cannot be able to generalize the findings with certainty. If more and more data is added to the functional regression model, the hypothesized relationship between two or more variables may not hold.

5.6 Suggestions for Further Research

This study focused on financial innovations and efficiency of commercial banks in Kenya and depended on secondary data. A research study where data collection depends on primary data i.e. in depth questionnaires and interviews covering all the 42 commercial banks registered with the Central Bank of Kenya is recommended so as to compliment this research.

The study was not exhaustive of the independent variables affecting efficiency of commercial banks in Kenya and it's recommended that further studies be carried out to incorporate other variables like management efficiency, growth opportunities, industry practices, age of the firm, political stability and other macro-economic variables. Establishing the effect of each variable on efficiency will enable policy makers know what tool to use when controlling the efficiency.

The study concentrated on the last five years since it was the most recent data available. Future studies may use a range of many years e.g. from 2000 to date and this can be help confirm or disapprove this study's results. The study limited itself by focusing on financial institutions. The recommendations of this study are that further studies be conducted on other non-financial institutions operating in Kenya. Finally, due to the inadequacies of the regression models, other models like the Vector Error Correction Model (VECM) can be applied in explaining the different associations between the variables.

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APPENDICES

Appendix I: List of Commercial Banks in Kenya

1. African Banking Corporation Ltd.
2. Bank of Africa Kenya Ltd.
3. Bank of Baroda (K) Ltd.
4. Bank of India
5. Barclays Bank of Kenya Ltd.
6. CFC Stanbic Bank Ltd.
7. Chase Bank (K) Ltd.
8. Citibank N.A Kenya
9. Commercial Bank of Africa Ltd.
10. Consolidated Bank of Kenya Ltd.
11. Co-operative Bank of Kenya Ltd.
12. Credit Bank Ltd.
13. Development Bank of Kenya Ltd.
14. Diamond Trust Bank (K) Ltd.
15. Dubai Bank Kenya Ltd.
16. Ecobank Kenya Ltd
17. Equatorial Commercial Bank Ltd.
18. Equity Bank Ltd.
19. Family Bank Ltd
20. Fidelity Commercial Bank Ltd
21. First community Bank Limited
22. Giro Commercial Bank Ltd.
23. GTB Ltd

24. Guardian Bank Ltd

25. Gulf African Bank Limited

26. Habib Bank A.G Zurich

27. Habib Bank Ltd.

28. Housing Finance

29. Imperial Bank Ltd

30. Investment & Mortgages Bank Ltd

31. Jamii Bora Bank.

32. Kenya Commercial Bank Ltd

33. Middle East Bank (K) Ltd

34. National Bank of Kenya Ltd

35. NIC BANK

36. Oriental Commercial Bank Ltd

37. Paramount Universal Bank Ltd

38. Prime Bank Ltd

39. Sidian Bank Ltd

40. Standard Chartered Bank (K) Ltd

41. Trans-National Bank Ltd

42. UBA Kenya Bank