EFFECT OF INTERNET BANKING ON EFFICIENCY OF COMMERCIAL BANKS IN KENYA

SAMUEL MUTHIGA KINYUA

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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.

Signed: _____Date: _____

SAMUEL MUTHIGA

D61/71208/2014

This research project has been submitted for examination with my approval as the University Supervisor.

Signed: _____Date: _____

DR. ANGELA KITHINJI

Lecturer, Department of Finance and Accounting

School of Business, University of Nairobi

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DEDICATION

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TABLE OF CONTENTS

DECLARATION ..... **ii**

ACKNOWLEDGEMENT ..... **iii**

DEDICATION ..... **iv**

LIST OF TABLES ..... **viii**

LIST OF FIGURES ..... **ix**

LIST OF ABBREVIATIONS ..... **x**

ABSTRACT ..... **xi**

CHAPTER ONE: INTRODUCTION **1**

1.1 Background of the Study 1

1.1.1 Internet Banking 2

1.1.2 Firm Efficiency 3

1.1.3 Internet Banking and Efficiency 5

1.1.4 Commercial Banksin Kenya 6

1.2 Research Problem 8

1.3 Objective of the Study 10

1.4 Value of the Study 10

CHAPTER TWO: LITERATURE REVIEW **11**

2.1 Introduction 11

2.2 Theoretical Framework 11

2.2.1 Technology Acceptance Model 11

2.2.2 Financial Intermediation Theory 12

2.2.3 Diffusion of Innovation Theory 13

2.3 Determinants of Firm Efficiency 14

2.3.1 Internet Banking 14

2.3.2 Bank Size 15

2.3.3 Bank Liquidity 16

2.3.4 Management Efficiency 16
2.3.5 Capital Adequacy 17
2.4 Empirical Review 17
2.4.1 Global Studies 17
2.4.2 Local Studies 19
2.5 Conceptual Framework 21
2.6 Summary of the Literature Review 22
CHAPTER THREE: RESEARCH METHODOLOGY 24
3.1 Introduction 24
3.2 Research Design 24
3.3 Population 24
3.4 Data Collection 24
3.5 Diagnostic Tests 25
3.6 Data Analysis 26
3.6.1 Conceptual Model 26
3.6.2 Analytical Model 27
3.6.3 Operationalization of Study Variables 27
3.6.4 Tests of Significance 28
CHAPTER FOUR: DATA ANALYSIS, FINDINGS AND INTERPRETATION 29
4.1 Introduction 29
4.2 Diagnostic Tests 29
4.3 Descriptive Analysis 31
4.4 Correlation Analysis 32
4.5 Regression Analysis 34
4.6 Discussion of Research Findings 37

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS 39

5.1 Introduction 39

5.2 Summary of Findings 39

5.3 Conclusion 40

5.4 Recommendations 41

5.5 Limitations of the Study 42

5.6 Suggestions for Further Research 43

REFERENCES 44

LIST OF TABLES

Table 4.1: Multicollinearity Test for Tolerance and VIF 30
Table 4.2: Normality Test 30
Table 4.3: Autocorrelation Test 31
Table 4.4: Descriptive Statistics 32
Table 4.5: Correlation Analysis 33
Table 4.6: Model Summary 34
Table 4.7: ANOVA 35
Table 4.8: Model Coefficients 36

LIST OF FIGURES

Figure 2.1: The Conceptual Model 22

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

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. 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. This study sought to determine the effect of internet banking on efficiency of commercial banks in Kenya. The study's population was all the 42 commercial banks operating in Kenya. Internet banking in this study was the independent variable and was measured by the natural logarithm of total value of transactions through internet banking. The control variables were liquidity as measured by the ratio of current assets to current liabilities, 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 0.175 which means that about 17.5 percent of the variation in the Kenyan commercial banks' efficiency can be explained by the four selected independent variables while 82.5 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=0.418). 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 internet banking and liquidity produced positive and statistically significant values for this study while bank size produced negative and statistically significant values for this study. The study found that capital adequacy is a non-statistically significant determinant of efficiency of commercial banks. This study recommends that measures should be put in place to enhance internet banking and liquidity among commercial banks as this will improve their efficiency.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Yilmaz, Alpkan and Ergun (2005) recognize technological innovations as critical enablers for organization's performance by creating value in the undeniably unpredictable and quickly evolving environment. In the dynamic and globally competitive environment, the inability of established banks to come up with breakthrough technological innovations that will help them operate effectively is a truism today (Davila, 2014). Technological 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 technological 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 will be informed by three theories. These are the financial intermediation theory, technology acceptance model as well as diffusion of innovation theory. Financial intermediation theory was directed by Mises (1912) who argues that financial institutions perform a critical role 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 developing channels that would permit them to transact easily and conveniently. 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 internet banking 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 internet banking services such as ATMs, internet banking and mobile banking have been adopted by commercial banks so as to reduce their operational costs. Internet banking deals with performance of a wide range of banking related services over the web or network connected to the customer's bank (Steven, 2002). Online banking service is offered by virtually all banks today and allows the clients to do all routine transactions, such as money transfer, e-payment of bills, account balance inquiry and online loan applications. Through the use of a terminal connected to the banking institution, a customer gains access to his or her account at his or her convenience. Customer service delivery efficiency has improved in a significant manner due to online banking. The world over, the banking industry has stressed on the significance of information systems for efficient customer services in step with technological advancements (Waithanji, 2016).

1.1.1 Internet Banking

Internet banking means using the internet as a delivery channel to carry out banking services, which consists of new banking services for example electronic bill presentment and payment and all traditional services for example printing statement,

bills payment, fund transfer to other accounts and balance enquiry without visiting a bank (Mukherjee & Nath, 2003). Xiao (2008) defines internet banking as a service that enables a bank client to effect a financial transaction anywhere, via electronic means without necessarily visiting the brick and mortar bank. Internet banking has not replaced traditional banking but relatively improved on quality service delivery, speed, decreased cost and optimized on efficiency of banking services (Gonzalez, 2008).

Electronic banking enables viewing of accounts and generating statements, paying bills, transferring money, scheduling electronic periodic payments like rent, bills or loan and opening accounts or loan application (Sathye, 1999). Banks are enhancing their traditional methods with e-banking because of its vast benefits. It has improved customer service because it is self-service in nature. Again, it is helping banks increase their account sales through a wide market reach and brings in new market opportunities which increase bank deposits. It is also a new source of fee-based income (KPMG, 1998).

Internet banking has brought down expenses like the cheque processing costs; cashiers and customer service staff cost through automation of services; cost of stationery due to online filling and processing of data and importantly data entry cost because customers fill applications themselves (Wright & Ralson, 2002). Average value of customer transactions via internet banking can be used to measure the usage of internet banking by commercial banks' customers.

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 ensure minimization of waste and maximization of 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 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 depicts the efficiency of the management of a company through comparing operating expense to net sales. The smaller the ratio, the

greater the ability of the organization in profits generation (Rao & Lakew, 2012). The current study will employ 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 Internet Banking 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 internet banking 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. Internet banking has been employed as a strategic resource for attainment of higher efficiency, reduction of cost and control of operations through replacement of paper based as well as labor intensive methods with automated processes and therefore causing higher productivity and profitability (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 the activation of horizontal repos, operationalization of credit reference bureaus, implementation of Microfinance Act, implementation of e-commerce in the payment systems and agency banking 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 technological innovations are directly proportional to improvements in efficiency (Upton & Kim, 1999). The process of technological 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 technological 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 alternative banking channels to reduce costs and enhance efficiency and convenience but still fail (Kombe & Wafula, 2015). This study entails a review of the impact of internet banking on efficiency of banks.

Kenyan banks have embraced ATMs, POS, mobile banking, internet banking, agency banking and card business. Alternative banking channels 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). Ogare (2001) observes that internet banking affects performance of commercial banks. However, a company may be efficient but not profitable or profitable but not efficient. More banks are embracing internet banking as a competitive strategy to increase performance but with little attention on indirect impact such as bank efficiency.

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 & Muganda (2011) and Batiz-Lazo & Woldesenbet (2006) argued that financial innovation influenced bank performance in a

significant manner. Other studies conducted such as Musiime and Malinga (2011) who studied on internet banking, consumer adoption and customer satisfaction and concluded that a positive and significant connection exists between Internet banking and customer satisfaction. Their study however didn't address the impact of internet banking on bank efficiency. Stoica, Mehdian and Sargu (2015) did a research on how internet banking impacts on the Romanian banks' performance and concluded that e-banking provides efficient and lower cost services which increase banks' performance.

Locally, Njogu (2014) studied on the influence of electronic banking on profitability of Kenyan Commercial Banks and established that there exists a strong positive relationship. Kombe and Wafula (2015) sought to establish whether e-banking has an impact on financial performance of Kenya's commercial banks and concluded that e-banking enables cheaper services with round the clock accessibility. 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. Mugodo (2016) researched on the influence of electronic banking on the financial performance of commercial banks in the Kenyan banking industry and established that electronic banking has a positive contribution to the financial performance. Although the studies conducted before in Kenya have studied on the effect of internet banking, most of them have focused on its effect on financial performance and not on efficiency which is the gap the current study leveraged on by answering the research question; what is the effect of internet banking on efficiency of Kenyan commercial banks?

1.3 Objective of the Study

This study's objective was to determine the effect of internet banking on efficiency of Kenyan commercial banks.

1.4 Value of the Study

The results of the research are very crucial 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 internet banking to increase efficiency of their respective banks.

To the government and other policy makers, this study's inference will help them to guide and formulate policies and guidelines that would assist commercial banks and other banks in the sector adopt internet banking that will enhance their efficiency and therefore contribute to the sector performance.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

The section gives a review of theories that form the foundation of this research. 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 internet banking and efficiency. The theoretical reviews covered are technology acceptance model, financial intermediation theory and diffusion of innovation theory.

2.2.1 Technology Acceptance Model

TAM as directed 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 the usage of technology by an individual (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 Kenya's commercial banks and how the accessibility of technology impacts the utilization of internet banking among Kenya's commercial banks. The theory is relevant to the current study as it explains how technology acceptance influences adoption of internet banking which is expected to affect bank efficiency in return.

2.2.2 Financial Intermediation Theory

The financial intermediation theory was advanced by Mises (1912) and postulates that that financial institutions especially banks perform a significant task 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 efficiency could be enhanced by improving customer deposits through development of channels such as internet banking 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 using 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 banking 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 trialability (Rogers 1995). Rogers argues that the level of new innovations adoption depends on the manner in which new organization perceives its relative advantage, trialability, compatibility, complexity and observability. If a Kenyan organization observes the benefits of internet banking, then this innovation 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. The theory relates to the current study as it explains how innovations such as internet banking are adopted in organizations.

2.3 Determinants of Firm Efficiency

The efficiency of firms can be affected by elements that are either external or internal to the firms and define the output level. The internal factors are different for each firm and determine its efficiency and they result from managerial decisions as well as the board. They are innovations, capital structure, firm size, liquidity, management efficiency, capital, market power etc. On the other hand, 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 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.

2.3.3 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.

2.3.4 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).

2.3.5 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 directions 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) studied the effect 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 influence of electronic banking on the performance of Jordanian banks over the period (2000 to 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) nations 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 customer's profession, brand perception, perceived value and service quality. The Likert scale based questionnaires were adopted in collecting data. It was 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 influence 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 research recommended that the banks ought to 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

Ogare (2013) studied the correlation between e-banking and performance of Kenyan commercial banks. Performance was determined by profit after tax and the e-banking variables consisted of number of POS terminals, debits and credit cards and ATMS given out and the level of usage of internet banking, mobile banking and EFT. The

results showed that as electronic banking usage rose, so did the performance of the banks.

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 customer's profession, brand perception, perceived value and service quality. 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 influence 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 research recommended that the banks ought to increase the number of ATMs so as to realize increased profitability. However, a negligible association existed between number of branches and the banks' profitability.

Gichungu and Oloko (2015) did an evaluation on the possibility of innovative technology having an effect in the performance of commercial institutions in the country. The study concentrated on determining the effect of mobile phone banking,

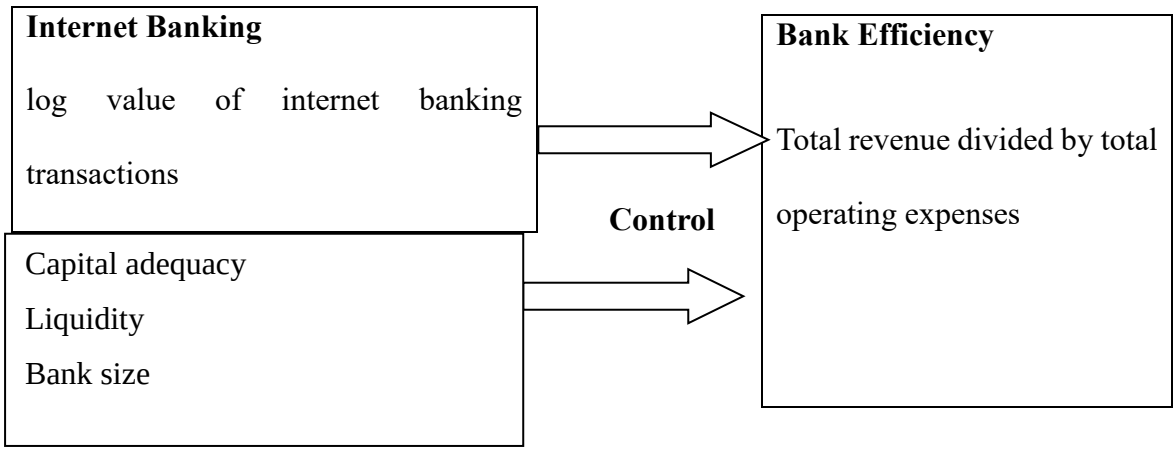
ATM banking, as well as other platforms currently being used by people to do banking such as online banking as well as agency banking on the performance of Kenya's financial banks through a target population of 43 Kenyan banks. By use of multiple linear regression method to analyze the data. The researchers' conclusion was that the banking platforms affected the financial performance of the sampled banks in a positive manner for a period of five years (2009 - 2013).

Mwiti (2016) did an examination of the influence of alternative banking channels on the financial performance of Kenyan commercial banks. He used five years (2011-2015) data for analysis. His study indicated that a strong relationship between alternative banking channels and financial performance existed. The study further established that mobile banking, ATMs banking, agency banking and internet banking affects financial performance positively 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 will be internet banking given as natural logarithm of the value of internet banking transactions per year. The control variables will be capital adequacy as measured by core capital to total customer deposits, liquidity as measured by the ratio of current assets divided by current liabilities, liquidity as measured liquid assets dividend by customer deposits and bank size as measured by natural logarithm of total assets. Efficiency will be the dependent variable that the study will seek to explain and it will be measured by total revenue divided by total operating expenses.

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 internet banking 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 primary influencers of firm efficiency have also been explored in this chapter. A number of local and international empirical studies have been carried out on internet banking and efficiency of firms. The findings of these studies have also been explored in this section.

The lack of consensus among international studies on the influence of internet banking 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 internet banking or consider financial performance as the dependent variable. The current study seeks to fill this research gap

by researching on the influence of internet banking on efficiency of Kenyan commercial banks.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

To establish the influence of internet banking on efficiency of commercial banks, a research methodology was 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 in order to determine the association between internet banking 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 study's population comprised of the 42 commercial banks that operate 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 acquired solely from the published annual financial reports of the commercial banks operating in Kenya between January 2013 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 connected by a mathematical equation Y=bX in which b is a constant number. The linearity test was acquired by use of 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 is normally distributed around the mean. This was 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).

Multi-collinearity 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 a complete linear dependence between them exists and as it approaches to zero then the multi-collinearity becomes more intense. Variance Inflation Factors (VIF) and tolerance levels were also carried out to show the degree of multi-collinearity (Burns & Burns, 2008).

3.6 Data Analysis

The SPSS software version 21 was used in the analysis of the data. The researcher quantitatively presented the findings using graphs and tables. Descriptive statistics were employed for summarizing and explaining the study variables as observed in the banks. The findings were revealed by use of percentages, frequencies, measures of central tendencies and dispersion displayed in tables. Inferential statistics included Pearson correlation, multiple regressions, ANOVA and coefficient of determination.

3.6.1 Conceptual Model

The study applied a conceptual model of the form:

$Y = f(X_1, X_2, X_3, X_4)$

Where:

Y= Efficiency of commercial banks

X_1 = Internet banking

X_2= Capital adequacy

X_3= Liquidity

X_4=Bank size

The importance of a regression model is to provide a basis for estimating the relationship between variables, specifically the relationship between internet banking and bank efficiency.

3.6.2 Analytical Model

The regression model below was adopted:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon.$$

In which: Y = Efficiency of commercial banks

α =y intercept of the regression equation.

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

X_1 = Internet banking

X_2= Capital adequacy

X_3= Liquidity

X_4= Bank size

ε =error term

3.6.3 Operationalization of Study Variables

Bank Efficiency	Ratio of total revenue to total operating expenses on an annual basis
Internet banking	Natural logarithm of the value of internet banking transactions per year
Capital adequacy	Ratio of core capital to total customer deposits on an annual basis
Liquidity	Ratio of current assets to current liabilities on an annual basis
Bank size	Natural logarithm of total assets on an annual basis

3.6.4 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 applied to determine the significance of the overall model and it was obtained from 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 internet banking 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 Multi-collinearity was carried out. Tolerance of the variable and the VIF value were applied in which values above 0.2 for Tolerance and values below 10 for VIF meaning that Multicollinearity doesn’t exist. Multiple regression is applicable if strong relationship among variables doesn’t exist. Based on the outcomes, all the variables had tolerance values >0.2 and VIF values <10 as displayed 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**
Internet banking	0.646	1.434
Capital adequacy	0.398	1.982
Liquidity	0.388	1.422
Bank size	0.376	1.398

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

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Efficiency	Statistic	Df	Sig.	Statistic	Df	Sig.
Internet banking	.173	205	.300	.918	205	.822
Capital adequacy	.180	205	.300	.894	205	.790
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 2.268 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	.418[a]	.175	.158	.068730	2.268

a. Predictors: (Constant), Bank Size, Liquidity, Capital adequacy, Internet banking

b. Dependent Variable: Efficiency

Source: Research Findings (2018)

4.3 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
Internet banking	205	6.605	9.712	8.48059	1.167510
Capital adequacy	205	.025	.969	.46090	.217898
Liquidity	205	.0022	.4298	.053317	.0612509
Bank Size	205	6.794	8.703	7.68560	.534062
Valid N (listwise)	205				

Source: Research Findings (2018)

4.4 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 applied in analyzing the level of association between the commercial banks' efficiency and the independent variables for this study (internet banking, liquidity, bank size and capital adequacy). It was discovered that internet banking and liquidity have a positive and statistically significant correlation with the commercial banks' efficiency as shown by (r =. 206, p = .003; and r = .149, p = .033) respectively. Bank size exhibited a negative and significant correlation with bank efficiency as shown by (r =-. 274, p = .000) while capital adequacy was found to be insignificant.

Table 4.5: Correlation Analysis

		Efficiency	Internet banking	Capital adequacy	Liquidity	Bank Size
Efficiency	Pearson Correlation	1				
	Sig. (2-tailed)					
Internet banking	Pearson Correlation	.206**	1			
	Sig. (2-tailed)	.003				
Capital adequacy	Pearson Correlation	.018	-.137	1		
	Sig. (2-tailed)	.801	.051			
Liquidity	Pearson Correlation	.149*	-.211**	-.059	1	
	Sig. (2-tailed)	.033	.002	.403		
Bank Size	Pearson Correlation	-.274**	.085	.032	-.003	1
	Sig. (2-tailed)	.000	.228	.644	.961	

**. 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)

4.5 Regression Analysis

Efficiency was regressed against four predictor variables; internet banking, 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 displayed in table 4.6 below.

Table 4.6: Model Summary

Model	R	R^2	Adjusted R^2	Std. Error of the Estimate	Durbin-Watson
1	.418[a]	.175	.158	.068730	2.268

a. Predictors: (Constant), Bank Size, Liquidity, Capital adequacy, Internet banking

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 R^2 value was 0.175, a discovery that 17.5 percent of the deviations in efficiency of commercial banks is caused by changes in internet banking, liquidity, bank size and bank capital adequacy. Other variables not included in the model justify for 82.5 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 0.418.

A durbin-watson statistic of 2.268 indicated that the variable residuals were not serially correlated since the value was more than 1.5.

Table 4.7: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.200	4	.050	10.591	.000[b]
	Residual	.945	200	.005		
	Total	1.145	204			

a. Dependent Variable: Efficiency

b. Predictors: (Constant), Bank Size, Liquidity, Capital adequacy, Internet banking

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 internet banking, 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 applied 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 reveals that the dependent variables have a statistically insignificant association with the independent variables. The results are indicated in table 4.8

Table 4.8: Model Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	.354	.077		4.583	.000
	Internet banking	.018	.004	.288	4.307	.000
1	Capital adequacy	.027	.022	.079	1.216	.225
	Liquidity	.261	.081	.213	3.233	.001
	Bank Size	-.042	.009	-.300	-4.651	.000

a. Dependent Variable: Efficiency

Source: Research Findings (2018)

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

The following regression equation was estimated:

$Y = 0.354 + 0.018X_1 + 0.261X_2 - 0.042X_3$

Where,

Y = Efficiency

X_1= Internet banking

X_2= Liquidity

X_3= Bank size

On the estimated regression model above, the constant = 0.354 shows that if selected dependent variables (internet banking, liquidity, bank size and bank capital adequacy)

were rated zero, the commercial banks' efficiency would be 0.354. A unit increase in internet banking and liquidity will result in an increase in efficiency by 0.18 and 0.261 respectively. A unit increase in bank size would result to a decrease in bank efficiency by 0.042. Capital adequacy was found to be an insignificant determinant of efficiency.

4.6 Discussion of Research Findings

The study aimed at establishing the association between internet banking and efficiency of the Kenyan commercial. Internet banking in this study was the independent variable and was measured by the natural logarithm of total value of transactions through internet banking. The control variables were liquidity as measured by the ratio of current assets to current liabilities, 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 internet banking and liquidity have a positive and statistically significant correlation with the commercial banks' efficiency. It also revealed that a negative and statistically significant correlation exists between bank size and efficiency of commercial banks. Capital adequacy exhibited a weak positive and insignificant association with efficiency of Kenyan banks.

The model summary revealed that the independent variables: internet banking, liquidity, bank size and bank capital adequacy explains 17.5% of changes in the dependent variable as depicted by R^2 value meaning this model doesn't include other factors that account for 82.5% of changes in the commercial banks' efficiency. The model is fit at 95% level of confidence since the F-value is 10.591. 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 Wadhe and Saluja (2015) who explored the influence 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. It was recommended that the banks ought to increase the number of ATMs so as to realize increased profitability. However, a negligible association existed between number of branches and the banks' profitability.

The study disagrees with Mwiti (2016) who did an examination of the influence of alternative banking channels on the financial performance of Kenyan commercial banks. His study used five years (2011-2015) data for analysis. His study indicated that a strong relationship between alternative banking channels and financial performance of commercial banks in Kenya existed. The study further established that mobile banking, ATMs banking, agency banking and internet banking influences financial performance of the commercial banks positively and in a statistically significant way.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The section 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 research aimed at examining the influence of internet banking on the Kenyan financial bank's efficiency. The independent variables for the study were internet banking, liquidity, bank size and bank capital adequacy. 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 internet banking and liquidity were discovered to have a positive and statistically significant correlation with the commercial banks' efficiency. The study also found out that a negative and statistically significant correlation exists between bank size and 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 0.175 which means that about 17.5 percent of the variation in efficiency of the Kenyan commercial banks can be explained by the four selected independent variables while 82.5 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=0.418). 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 0.354. A unit increase in internet banking and liquidity will result in an increase in efficiency by 0.18 and 0.261 respectively. A unit increase in bank size would cause a decrease in bank efficiency by 0.042. Capital adequacy was found to be an insignificant determinant of efficiency.

5.3 Conclusion

It can be concluded from the findings that the Kenyan commercial banks' efficiency is significantly affected by internet banking, liquidity and bank size. The study therefore concludes that a unit increase in internet banking and liquidity causes a significant increase in efficiency. The study found that bank size has a negative and statistically significant effect on efficiency and therefore this study concludes that an increase in bank size will cause a significant decline in Kenyan commercial bank's efficiency.

This study concludes that independent variables selected for this study internet banking, 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 17.5% of changes in efficiency imply that the variables not included in the model explain 82.5% of changes in Kenyan commercial banks' efficiency

Results agree with Wadhe and Saluja (2015) who explored the influence 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. It recommended that the banks ought to increase the number of ATMs so as to realize increased profitability. However, a negligible association existed between number of branches and the banks' profitability.

5.4 Recommendations

The study established that internet banking has a positive and significant influence on efficiency. Thus the study wishes to make the following recommendations for policy change: Commercial banks in Kenya should invest heavily in internet banking 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 research discovered a desirable and notable influence of liquidity on efficiency of commercial banks. This study recommends that regulators and policy makers in the banking industry should come with measures of ensuring that banks are operating at sufficient levels of liquidity and this will cause a notable increase in commercial banks' overall efficiency.

The study concluded that there is negative relationship between efficiency and size of a bank. This study recommends that banks' management and directors should aim at

increasing their utilization of their assets as this study has found big banks to be more inefficient that small banks. If a bank's assets are put to maximum use, then the size of a bank would not negatively influence efficiency.

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 internet banking 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 and it's recommended that further studies be carried out to incorporate other variables like liquidity, 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 as at 31st December 2017

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.

Appendix II: Research Data

COMPANY	Year	Internet banking	Efficiency	Capital adequacy	Liquidity	Bank Size
ABC Bank	2013	6.611	0.144	0.513	0.0677	7.280
	2014	6.605	0.151	0.456	0.0606	7.293
	2015	6.741	0.172	0.676	0.0512	7.331
	2016	6.717	0.165	0.745	0.0413	7.344
	2017	6.748	0.160	0.723	0.0498	7.351
Bank of Baroda	2013	6.749	0.235	0.274	0.0425	7.664
	2014	6.790	0.216	0.325	0.0414	7.716
	2015	6.790	0.242	0.289	0.0751	7.792
	2016	6.605	0.271	0.295	0.0766	7.834
	2017	6.605	0.079	0.275	0.0835	7.919
Barclays	2013	6.611	0.079	0.643	0.1096	8.267
	2014	6.611	0.089	0.666	0.0535	8.316
	2015	6.686	0.094	0.664	0.0332	8.354
	2016	6.686	0.094	0.653	0.0290	8.382
	2017	6.686	0.107	0.637	0.0349	8.414
Bank of Africa	2013	6.717	0.108	0.116	0.0306	7.690
	2014	6.717	0.108	0.132	0.0370	7.722
	2015	6.741	0.110	0.166	0.0337	7.794
	2016	6.741	0.110	0.147	0.0443	7.841
	2017	6.748	0.112	0.127	0.0782	7.748
Bank of India	2013	6.748	0.119	0.701	0.1436	7.716
	2014	6.749	0.123	0.691	0.1503	7.792
	2015	6.749	0.127	0.702	0.0389	7.834
	2016	6.768	0.129	0.650	0.0453	7.919
	2017	6.768	0.135	0.538	0.2474	8.267
Chase bank	2013	6.768	0.139	0.733	0.0314	7.691
	2014	6.790	0.140	0.661	0.0379	7.884
	2015	6.790	0.140	0.595	0.0227	8.030
	2016	6.790	0.148	0.608	0.0216	7.150
	2017	6.790	0.149	0.550	0.0434	7.144
Citibank	2013	6.796	0.150	0.383	0.0676	7.842
	2014	6.796	0.150	0.355	0.0519	7.853
	2015	6.796	0.150	0.403	0.0598	7.900
	2016	6.805	0.150	0.573	0.0704	7.945
	2017	6.805	0.150	0.561	0.0642	8.014

COMPANY	Year	Internet banking	Efficiency	Capital adequacy	Liquidity	Bank Size
Commercial Bank of Africa	2013	6.805	0.151	0.289	0.0660	8.002
	2014	6.883	0.151	0.551	0.0488	8.096
	2015	6.883	0.153	0.431	0.0197	8.245
	2016	6.883	0.153	0.765	0.0133	8.298
	2017	6.919	0.154	0.580	0.0072	8.324
Consolidated bank	2013	6.919	0.154	0.248	0.0097	7.255
	2014	6.919	0.155	0.241	0.0129	7.225
	2015	8.139	0.155	0.358	0.0191	7.178
	2016	8.139	0.156	0.228	0.0230	7.150
	2017	8.139	0.158	0.221	0.0487	7.144
Credit bank	2013	8.146	0.159	0.514	0.0289	6.807
	2014	8.146	0.159	0.530	0.0259	6.864
	2015	8.146	0.159	0.587	0.0105	6.948
	2016	8.154	0.160	0.693	0.0107	7.012
	2017	8.154	0.160	0.607	0.0120	7.086
Development Bank of Kenya	2013	8.154	0.161	0.535	0.0079	7.491
	2014	8.163	0.161	0.592	0.0073	7.638
	2015	8.163	0.161	0.508	0.0113	7.791
	2016	8.163	0.162	0.693	0.0184	7.910
	2017	8.167	0.162	0.763	0.0197	7.842
Diamond Trust Bank	2013	8.167	0.162	0.795	0.0486	8.267
	2014	8.167	0.162	0.785	0.0476	8.316
	2015	8.201	0.163	0.697	0.0230	8.354
	2016	8.201	0.163	0.668	0.0296	8.382
	2017	8.201	0.163	0.683	0.0193	8.414
Dubai bank	2013	8.230	0.164	0.307	0.0225	7.664
	2014	8.230	0.164	0.229	0.0318	7.716
	2015	8.230	0.172	0.328	0.0397	7.792
	2016	8.238	0.173	0.810	0.0448	7.834
	2017	8.238	0.173	0.746	0.0417	7.919
Ecobank	2013	8.238	0.175	0.156	0.0459	7.502
	2014	8.251	0.177	0.174	0.0370	7.567
	2015	8.251	0.177	0.336	0.0375	7.662
	2016	8.251	0.177	0.322	0.0269	7.720
	2017	8.266	0.179	0.377	0.0302	7.673

COMPANY	Year	Internet banking	Efficiency	Capital adequacy	Liquidity	Bank Size
Equatorial Commercial bank/Spire Bank	2013	8.266	0.179	0.393	0.0237	7.149
	2014	8.266	0.179	0.444	0.0242	7.192
	2015	9.209	0.180	0.384	0.0338	7.220
	2016	9.209	0.181	0.328	0.0401	7.160
	2017	9.209	0.181	0.270	0.0318	7.140
Family bank	2013	9.256	0.181	0.142	0.0386	7.491
	2014	9.256	0.181	0.104	0.0383	7.638
	2015	9.324	0.181	0.090	0.0507	7.791
	2016	9.324	0.182	0.188	0.0353	7.910
	2017	9.331	0.182	0.295	0.0284	7.842
Fidelity bank	2013	9.331	0.182	0.582	0.0197	7.234
	2014	9.331	0.184	0.529	0.0154	7.409
	2015	9.336	0.185	0.569	0.0088	7.518
	2016	9.336	0.185	0.462	0.0097	7.468
	2017	9.336	0.187	0.507	0.0179	7.472
First Community Bank	2013	9.340	0.188	0.437	0.0213	6.998
	2014	9.340	0.188	0.465	0.1076	7.053
	2015	9.340	0.189	0.486	0.0143	7.184
	2016	9.384	0.189	0.495	0.1187	7.163
	2017	9.384	0.189	0.615	0.0000	7.175
Giro Commercial Bank Ltd	2013	9.384	0.190	0.598	0.0369	7.290
	2014	9.400	0.190	0.797	0.0173	8.043
	2015	9.400	0.190	0.966	0.0116	8.138
	2016	9.400	0.190	0.366	0.0098	8.170
	2017	9.403	0.191	0.446	0.0161	8.215
Guaranty Trust Bank	2013	9.403	0.193	0.782	0.0269	7.234
	2014	9.403	0.197	0.419	0.0293	7.409
	2015	9.415	0.198	0.867	0.0656	7.518
	2016	9.415	0.199	0.520	0.0187	7.468
	2017	9.415	0.199	0.475	0.0820	7.472
Guardian Bank	2013	9.420	0.200	0.466	0.0807	7.167
	2014	9.420	0.201	0.381	0.0962	7.108
	2015	9.420	0.201	0.383	0.0529	7.163
	2016	9.423	0.202	0.394	0.0499	7.165

COMPANY	Year	Internet banking	Efficiency	Capital adequacy	Liquidity	Bank Size
	2017	9.423	0.202	0.471	0.0436	7.167
Gulf African Bank	2013	9.423	0.203	0.279	0.0461	8.291
	2014	9.424	0.205	0.285	0.0459	8.343
	2015	9.424	0.205	0.295	0.0483	8.347
	2016	9.424	0.205	0.266	0.0421	8.369
	2017	9.426	0.206	0.280	0.0444	8.399
Habib Bank Ltd	2013	9.426	0.206	0.277	0.0322	6.945
	2014	9.426	0.208	0.240	0.0498	6.985
	2015	9.433	0.209	0.261	0.0382	7.010
	2016	9.433	0.209	0.240	0.0205	7.019
	2017	9.433	0.210	0.216	0.0130	7.016
Standard Chartered Bank Kenya Ltd	2013	9.436	0.210	0.820	0.0334	8.291
	2014	9.436	0.210	0.888	0.0201	8.343
	2015	9.436	0.211	0.801	0.0234	8.347
	2016	9.454	0.211	0.855	0.0557	8.369
	2017	9.454	0.211	0.868	0.0344	8.399
NIC Bank	2013	9.454	0.212	0.078	0.0295	8.035
	2014	9.460	0.213	0.091	0.0167	8.083
	2015	9.460	0.213	0.148	0.0091	8.164
	2016	9.460	0.214	0.191	0.0223	8.219
	2017	9.479	0.214	0.239	0.0124	8.229
National Bank	2013	9.479	0.214	0.265	-0.0022	7.827
	2014	9.479	0.216	0.221	-0.0020	7.966
	2015	9.480	0.216	0.229	-0.0021	8.089
	2016	9.480	0.216	0.253	0.0074	8.096
	2017	9.480	0.216	0.303	0.0071	8.061
KCB Bank	2013	9.486	0.220	0.294	0.0064	8.484
	2014	9.486	0.223	0.280	0.0091	8.509
	2015	9.486	0.225	0.284	0.2144	8.576
	2016	9.492	0.226	0.382	0.0005	8.670
	2017	9.492	0.227	0.283	0.0005	8.703
I&M Bank	2013	9.492	0.228	0.271	0.0782	7.290
	2014	9.501	0.228	0.267	0.0627	8.043
	2015	9.501	0.228	0.236	0.0327	8.138
	2016	9.501	0.230	0.241	0.0199	8.170
	2017	9.506	0.232	0.526	0.0182	8.215

COMPANY	Year	Internet banking	Efficiency	Capital adequacy	Liquidity	Bank Size
Jamii Bora Bank Ltd	2013	9.506	0.236	0.530	0.0305	8.291
	2014	9.506	0.236	0.537	0.0588	8.343
	2015	9.513	0.238	0.452	0.1513	8.347
	2016	9.513	0.238	0.139	0.0345	8.369
	2017	9.513	0.238	0.939	0.0286	8.399
HFCK	2013	9.523	0.238	0.728	0.0180	7.609
	2014	9.523	0.240	0.673	0.0135	7.670
	2015	9.523	0.247	0.587	0.0162	7.782
	2016	9.526	0.250	0.476	0.0220	7.001
	2017	9.526	0.250	0.437	0.0240	7.000
Equity Bank	2013	9.526	0.255	0.388	0.0256	8.334
	2014	9.539	0.255	0.347	0.0310	8.377
	2015	9.539	0.260	0.346	0.0546	8.441
	2016	9.539	0.260	0.348	0.0537	8.533
	2017	9.551	0.260	0.347	0.1365	8.579
Co-operative Bank	2013	9.551	0.260	0.310	0.0864	8.300
	2014	9.551	0.260	0.357	0.0569	8.360
	2015	9.605	0.265	0.369	0.0654	8.451
	2016	9.605	0.266	0.683	0.0748	8.531
	2017	9.605	0.270	0.679	0.1066	8.544
CFC Stanbic	2013	9.617	0.270	0.594	0.0904	7.670
	2014	9.617	0.270	0.763	0.0752	7.782
	2015	9.617	0.273	0.754	0.0475	8.234
	2016	9.618	0.280	0.875	0.0546	8.298
	2017	9.618	0.284	0.535	0.0475	8.312
Krep Bank	2013	9.618	0.290	0.799	0.0091	6.980
	2014	9.625	0.295	0.906	0.0065	7.121
	2015	9.625	0.295	0.889	0.0106	7.199
	2016	9.625	0.300	0.530	0.0023	7.281
	2017	9.630	0.300	0.403	0.0043	7.320
Middle East Bank (K) Ltd	2013	9.630	0.300	0.046	0.0068	6.861
	2014	9.630	0.305	0.075	0.0086	6.905
	2015	9.644	0.306	0.075	0.0085	7.017
	2016	9.644	0.307	0.084	0.0166	7.022
	2017	9.644	0.310	0.364	0.0251	6.974

COMPANY	Year	Internet banking	Efficiency	Capital adequacy	Liquidity	Bank Size
Oriental Commercial Bank Ltd	2013	9.712	0.312	0.560	0.0190	6.794
	2014	9.712	0.325	0.524	0.1206	6.846
	2015	9.712	0.325	0.526	0.0900	6.895
	2016	9.256	0.339	0.555	0.0677	6.929
	2017	9.324	0.350	0.025	0.0890	6.997
Paramount Universal Bank Ltd	2013	6.611	0.354	0.969	0.0789	6.861
	2014	6.605	0.394	0.718	0.0729	6.905
	2015	6.741	0.398	0.710	0.0538	7.017
	2016	6.717	0.402	0.636	0.0805	7.022
	2017	6.748	0.402	0.567	0.1270	6.974
Prime Bank	2013	6.749	0.405	0.491	0.2022	6.846
	2014	6.790	0.409	0.492	0.2874	6.895
	2015	6.790	0.410	0.448	0.1759	7.740
	2016	6.796	0.415	0.423	0.1022	7.813
	2017	6.805	0.420	0.437	0.0532	7.815
Trans-National Bank Ltd	2013	6.768	0.420	0.787	0.0667	6.945
	2014	6.883	0.423	0.486	0.0690	6.985
	2015	8.201	0.457	0.392	0.0696	7.010
	2016	8.146	0.480	0.280	0.0905	7.019
	2017	8.251	0.205	0.382	0.3037	7.016
UBA Kenya Bank Ltd	2013	8.238	0.211	0.283	0.2796	7.290
	2014	8.266	0.187	0.271	0.4298	8.043
	2015	8.139	0.181	0.267	0.3706	8.138
	2016	8.154	0.190	0.236	0.1888	8.170
	2017	8.163	0.150	0.241	0.1558	8.215
Victoria Commercial Bank Ltd	2013	8.167	0.160	0.526	0.1566	7.014
	2014	8.230	0.181	0.530	0.0458	7.135
	2015	6.919	0.190	0.537	0.0274	7.237
	2016	6.686	0.220	0.452	0.0177	7.301
	2017	9.506	0.214	0.728	0.0142	7.350