

**ADOPTION OF FINANCIAL INNOVATIONS BY TIER ONE COMMERCIAL
BANKS AND FINANCIAL DEEPENING IN KENYA**

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DECLARATION

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DEDICATION

This project is dedicated to my parents, who taught me that the best kind of knowledge to have is that which is learned for its own sake and that even the largest task can be accomplished if it is done one step at a time.

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TABLE OF CONTENTS

DECLARATION	ii
DEDICATION	iii
ACKNOWLEDGEMENT	iv
TABLE OF CONTENTS	v
LIST OF FIGURES	viii
LIST OF TABLES	ix
LIST OF APPENDICES	x
DEFINITION OF TERMS	xi
ACRONYMS AND ABBREVIATIONS	xiii
ABSTRACT	xv
CHAPTER ONE	1
INTRODUCTION	1
1.1 Background of the Study	1
1.2 Statement of the Problem.....	10
1.3 Research Objectives.....	11
1.4 Hypotheses of the Study	12
1.5 Significance of the Study.....	12
1.6 Scope of the Study	13
1.7 Organization of the Study	14
CHAPTER TWO	16
LITERATURE REVIEW	16
2.1 Introduction.....	16

2.2 Theoretical Framework.....	16
2.3 Empirical Review.....	19
2.4 Summary of Literature and Research Gaps	29
2.5 Conceptual Framework.....	32
CHAPTER THREE	34
RESEARCH METHODOLOGY	34
3.1 Introduction.....	34
3.2 Research Design.....	34
3.3 Target Population.....	34
3.5 Data Collection Instrument	35
3.6 Reliability of Research Instrument	35
3.7 Validity of Research Instrument	36
3.8 Data Analysis	36
3.9 Variables Definition and Measurement	37
3.10 Diagnostic Tests.....	37
3.11 Ethical Considerations	41
CHAPTER FOUR.....	42
EMPIRICAL RESULTS, INTERPRETATIONS AND DISCUSSIONS.....	42
4.1 Introduction.....	42
4.2 Descriptive Statistics.....	42
4.3 Inferential Statistics	44
4.4 Correlation Analysis	45
4.5 Panel Diagnostic Tests.....	46

4.6 Regression Analysis.....	53
CHAPTER FIVE	56
SUMMARY, CONCLUSION AND RECOMMENDATIONS.....	56
5.1 Introduction.....	56
5.2 Summary of the Study	56
5.3 Conclusions.....	58
5.4 Recommendations.....	59
5.5 Limitations of the Study.....	62
5.6 Contribution of the Study.....	62
REFERENCES.....	63
APPENDICES.....	71

LIST OF FIGURES

Figure 2.1 Conceptual Framework.....	33
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LIST OF TABLES

Table 2.1 Summary of Literature Review and Research Gaps	30
Table 3.1 Operationalization of Variables	37
Table 4.1 Descriptive Statistics	43
Table 4.2 Correlation Analysis.....	45
Table 4.3 Stationarity Test	47
Table 4.4 Multicollinearity Test.....	48
Table 4.5 Serial Correlation Test	49
Table 4.6 Heteroskedasticity Test	50
Table 4.7 Granger Causality.....	51
Table 4.8 Hausman Test.....	52
Table 4.9 Regression Analysis	53

LIST OF APPENDICES

Appendix I Introduction Letter	71
Appendix II Research Instrument (Disclosure Check List).....	72
Appendix III List of Commercial Banks in Kenya	73
Appendix IV NACOSTI Research Permit.....	74

DEFINITION OF TERMS

Adoption of Financial Innovations	Use of banking innovations by the populations and commercial banks who are already in the know how to use technology.
Agency Banking	Provision of banking services through a third party rather than the normal banking branch, or the provision of agency services by commercial banks through acting as tax collection agents.
Automated Teller Machine Banking	An electronic telecommunication platform which enables customers of banks to perform non-aided banking transactions.
Commercial Bank	This is an institution that provides services such as accepting deposits, providing business loans, and offering basic investment products.
Financial Deepening	The state in which individuals gain access to financial services at affordable rate and without non-trade barriers.
Financial Innovation	Financial innovation in the banking sectors is defined as the development of new or better products or processes that leads to low cost of production from the existing financial services.

Internet Banking

An electronic payment system that enables customers of financial institution to conduct a range of financial transactions through the financial institution's website.

Mobile Banking

Execution of commercial banking services through mobile phones aided platforms.

Tier 1 Banks

These are banks with weighted index of five percent and above in terms of net assets, capital, capital reserves, number of loans and deposit accounts.

ACRONYMS AND ABBREVIATIONS

ATM	Automatic Teller Machine
CB	Commercial Bank
CBK	Central Bank of Kenya
CCK	Communication Commission of Kenya
FEM	Fixed Effect Model
FGLS	Feasible Generalized Least Squares
FS	Financial Savings
FSD	Financial Sector Deepening
GDP	Gross Domestic Products
IMF	International Monetary Funding
INFLA	Inflation
KCB	Kenya Commercial Bank
KNBS	Kenya National Bureau of Statistics
MS	Money Supply
PLRA	Prime Lending Rates
POS	Point of Sale
PSC	Private Sector Credit
REM	Random Effect Model

ROA	Return on Assets
ROE	Return on Equity
VIF	Variance Inflation Factors

ABSTRACT

Kenya envisions that by 2030 it will realize the three pillars of success that is social, economic and political development. These pillars are not likely to be achieved if the country adopts same way of doing things, thus innovations in all sector is vital. Innovation accelerates growth in all the three pillars and more so economy. Although, bank innovations are of convincing importance when checked in terms of financial performance, the effect created by the innovation on financial deepening is still not clear. The general objective of the study was to establish the effect of the adoption of financial innovations by tier one commercial banks and financial deepening in Kenya. Specifically, the study sought to establish mobile, agency, automated teller machine and internet banking on financial deepening in Kenya. The study was based on diffusion theory of innovation and theory of financial deepening. The study adopted correlation research design. In the current study the target population composed of 6 banks in tier one. Census approach was used to select 6 tier one commercial banks from 2010 to 2018. Data was analysed using descriptive statistics, correlation analysis and multiple regression analysis with the aid of STATA 12. The regression coefficients were tested for significance using t-statistics at 5% confidence level. Diagnostic tests that conducted include auto correlation, multicollinearity, heteroscedasticity, fixed and random effects and normality. The study findings found that commercial banks in tier one had an average financial deepening of 16.61. Regression analysis revealed that mobile banking, agency banking, automatic teller banking and internet banking have positive and significant effect on financial deepening of tier one commercial banks in Kenya. There is need to take advantage of agency banking services especially in regions which have low mobile phone penetration and adopt agency banking services owing to proximity to banking agents. Data security should be provided to enhance authorization procedure when using automatic teller machines banking services. Owing to positive reception and adoption of internet banking there is need for commercial banks to take advantage of it since it will minimize operational costs and optimize provision of banking services. Banking regulators such as Central Bank of Kenya and Capital Market Authority for listed tier one commercial banks should liberalize financial innovation. To bank managers, since adoption of financial innovations has significant effect on financial deepening, there is need for them to develop innovative approaches to optimize their financial performance. This indicates that there is need for development and adoption of mobile banking, agency banking, automatic teller machines banking and internet banking that would minimize operational costs. There is need for regulation and control of agency banking services to optimize financial performance of banks.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Financial sector is a major drive that spurs growth in economies. Banks being the major players in the financial sector, act as the engine that control the entire activities of the economic growth through financial deepening. Banks provide access to financial services that steer economic development in a country (Ngugi, Amanja & Maana, 2009). However, as Waithanji (2012) observed there is still inadequate access to the banking services as displayed by large number of savers and small depositors, while on the other side lending is positively skewed toward well-established private and public enterprises in the uptown regions. Furthermore, when financial access is granted, they come at a prohibitive cost (Beck, *et al.*, 2010).

Financial sector has undergone development phases which were aimed at and the Kenyan perspective is grouped into three phases with the earliest period being in 1970s and 1980s when the government had monopoly on provision of banking services (Misati, Njoroge, Kamau & Ouma, 2010). In the second stage, though there were government controls, the sector was liberalized. Monetary policies and structural adjustments were applied to manage financial sector operations. In phase three, banking innovations such as automation of banking services, Islamic and electronic banking approaches were adopted and their implications on financial inclusion and deepening is commendable.

In the analysis of the competition for the banks in East Africa, Sanya and Gaertne (2012) affirm that the impeccable growth experienced in the banks over the last one decade can be ascertained from the reforms made in the industry, and leading role in the banking innovations. Expansion in the banking innovations has seen break in many forms of traditional banking. The advent and increased use of mobile phone has further accelerated expansion patterns and products in the banking industry courtesy of mobile innovations. All this has been caused by the desire to maintain a competitive edge in the financial market. These innovations have altered demand for traditional banking services and has increased likelihood of accessing banking services (Ngii, 2013). The study conceptualized an influence of mobile banking, agency banking, Automated Teller Machine, internet banking and financial deepening of tier one commercial banks in Kenya.

1.1.1 Financial Deepening

Financial deepening is the state in which individuals gain access to financial services at affordable rate and without non-trade barriers (Kenyoru, 2013). Okafor, Omwumere and Chijindu (2016) understand financial deepening as the situation where there is enough liquidity and financial intermediation is being carried out smoothly. Through financial intermediation, savers with surplus and borrowers with deficit are brought together thus helping conversion of the immediate need. As Ngugi *et al.* (2009) cites financial deepening is also viewed as the increase of assets and access to financial services that offers wider range of services.

Financial deepening as indicated by banks' credit to private sector in respect to country Gross Domestic Product (GDP) has differed in many countries. For instance, in Nigeria credit to private sector recorded a 12.59% in 2013 and the highest values witnessed over 50 years is 38.35% whereas in South Africa, financial deepening as measured by credit to private sector as percentage of GDP has showed 67.38% in 2013 and the highest value to be 72.29% in the last 50 years (Karimo & Ogbonna, 2017). This can be interpreted to mean that in South African residents and companies can easily access financial services than Nigerian citizens and companies. Several researchers assert that financial deepening is a big stimulant to growth.

According to Vision 2030, financial sector is expected to be vibrant and competitive in the global market that is meant to steer savings that would see Kenya increase its investment. Having more people being included on financial sector will in both short and long run enables the country to achieve economic growth. Since 2009 Kenya has recorded upward trend in terms of GDP. A mapping of financial access points by Central Bank supervision annual report of 2015 indicates that 73% of the Kenyan population live within 3 kilometres radius of financial touch point compared to other countries in East African countries that fall far much behind. The report also shows that as compared to 2013, there is rise in number of money agents of about 37.9% and 24% increase in stand-alone ATMs (Omondi, 2015).

Financial inclusion enables all to have equal opportunities. As cited in Millennium Development Goals, one of the most importance items to enable the other entire goal is finance. Increased investment and more productivity translate to better health, nutrition and

education. All this is earmarked as development of a nation leading to reduced inequality while increasing then opportunities for many (Stijn, Patrick & Liliana, 2009).

1.1.2 Financial Innovations by Commercial Banks

Banking innovation is perceived to be the development of new products which are aimed at lowering operational costs and easing access of banking services (Nofie, 2011). Innovation acts as a catalyst to a sustainable economic growth. Different forms of innovations exist including the financial and technological innovations. Over the years banking innovations has grown to help allocate funds to the profitable projects and in diversification of risks (Ho, Huang, Shi & Wu, 2017).

Dedication to digitize all the banking platforms to ease accessibility to the wide and growing number of consumers has seen large proportion of banks' budget being allocated on technology innovation for security of their operation. According to Meola (2016) more than 40% American banks have set more than 25% of the banks budget to information technology for transformation to digital. In emerging countries and Kenya in particular, mobile phones have had dramatic and wondrous impact. Being the first modern infrastructure in rural and remote areas, they have greatly cut down the communication costs and service delivery have also improved tremendously (Ngumi, 2013) as well as presenting platform in which innovation can be harboured. This has had greater economic benefits and improvement in both agricultural and labour markets. Processes of service delivery have also been made efficient thus transforming lives of many via innovative applications.

Mobile phone service providers have placed this a notch higher by launching products similar to those offered by banks. This has intensified competition for customer leading to partnerships with the banks to affect their transactions. By doing so, chances for creating more innovative products were opened. To date, banks have rolled out mobile apps that enable customers to transact at the comfort of their house.

Adoption of information communication and technology has lowered banking operational costs, opened new revenue opportunities and advanced financial inclusion and access (Mwania & Muganda, 2011). This has further led to increased banking innovations by the fact that the population are already in the know how to use technology. Banks has taken advantage of this to roll out their long-awaited innovations that are not only convenient but also affordable to their customer and to them too. Overtime there has been use of financial services via mobile phones that comes after introduction of ATMs banking. Availability of phone and affordable internet has seen banks innovatively create applications that further enhance banking transactions. In order to reach even the remote areas without good internet connectivity and phone network, agency banking has been introduced to reach out all corners. As such these four recent banking innovations form the foundation of this research.

A case in Bangladesh has shown that mobile phones have altered financial exclusion amongst non-banked population (Rayhan, Sohel, Islam, & Mahjabin, 2012). As explained by Ngumi (2013) with mobile phones being in the possession of many people, mobile banking can be transacted at anytime, anyplace all over the country, conveniently, affordably and securely. According to Mwangi (2014) mobile banking play three main roles, namely, direct

connecting to user' s bank account, remote mobile payment and proximity of mobile payments.

In addition, agency banking is deemed to be in operation where financial services are provided by an agent instead of the banking institution itself. This is aimed at reaching out wide areas to increase financial inclusion to the unbanked or under banked individuals without compromising the integrity and soundness of the banking systems. Introduction of Kenya agent banking in 2010 saw the government bridge the wide gap that left many excluded from financial transactions. Currently, more than 30,000 outlets registered as bank agents (CBK, 2016) and the number is growing day by day following more application being done to banks for agency contract. By the increased number of agency bank branches are now able to handle smaller pools of high net-worth clients to whom they need to pick the cash-rich operations (Barasa & Mwirigi, 2013).

Further, the desire to meet the regulations set and the competition in the market has amplified the importance of banking automation which has altered banking models through use of Automated Teller Machines (ATMs). Compared to retail banking, use of ATMs has increased access to financial services and reduced banking services access inefficiencies. Cost of setting up one ATM is nowhere close to that of retail bank office (Mwangi, 2014). Establishment of ATM banking has really helped the unbanked community which make up to around 50% of adult population in the world.

Moreover, internet banking is now becoming a vital tool that can be used to access information and enhances communications. Communication Commission of Kenya (CCK,

2012) observed that about half of the Kenyan population have access to internet *almost* daily, their serve being mobile phone network (Kathuo, Rotich & Anyango, 2015). The dramatic changes that have been witnessed over the last ten years or so, has been accelerate by factors such as globalization, policy changes and integration of banking services with information technology devices. Presence of reliable and high-speed internet has further seen banks focus to reach their customer in that direction. Through the internet, banks have been able to achieve a lot based on contemporary business setting. From traffic jams to one' s comfort, customers are now able to receive live updates about their fund transfer, bill payment and maintain one' s account through the internet, just to mention a few. Again, via internet banking customers are able to carry out simple and sophisticated banking transactions such as debit and credit notifications, balance enquiry, cheque status tracking and reminders to bill payment activation (Anyasi & Otubu, 2009).

According to FSD (2016) financial exclusion statistics in Kenya has decreased from 25% to 17% from 2013 to 2016. Mobile banking has been credited to these statistics since at least 71% of Kenyan adult population has access to mobile phones. Telecommunication companies has partnered with commercial banks and innovative products have been developed for example M-shwari as partnership between commercial bank of Africa and Safaricom, KCB- Mpesa, partnership between Kenya Commercial Bank and Safaricom. Recently, Safaricom introduced in January 2019. In 2016, there was also an increase in the percentage of adults using informal savings groups (41.4%) and insurance products (24.3%) mostly attributed to increasing uptake of statutory insurance, notably the National Hospital Insurance Fund. The increasing levels of inclusion are reflected in supply-side data. Banking

deposits increased from 36.5 million to 40.1 million from 2015 to 2016. Mobile based accounts opened increased in the said period. According to the CBK, 23.8 million transactions were conducted through bank agents in the third quarter of 2016. Customer deposits grew by 2.3% from KSh 2,627 billion in June 2016 to KSh 2,687 billion in September 2016. Mobile money continued to be a major driver of financial inclusion last year. Mobile money payments increased from 1.1 billion to 1.5 billion from 2015 to 2016. The number of agents grew from 143,9461 to 165,908 during the same period. Data from the CBK shows that customers use mobile money services more frequently at an average of 4.2 times per month by December 2016, and for smaller transaction sizes, which decreased from KSh 2,486 in December 2015 to KSh 2,167 in December 2016. The mobile money market continues to be very concentrated. Over 84% of transactions and 65% of subscriptions are done through Safaricom' s M-Pesa.

1.1.3 Commercial Banks

Kenya banking sector have 43 commercial banks, 13 micro finance banks and 1 mortgage institutions all under regulations of Central Bank of Kenya (CBK) and those listed are regulated by Capital Market Authority (CMA) (Maina, 2020). According to Kariuki (2013) banks to population size is higher in Kenya as compared to Nigeria and South Africa. Surprisingly, financial performance is better in Nigeria and South Africa as compared to Kenya. Furthermore, there has been reported cases of failure of commercial banks recently that have been attributed to corporate governance practices and competition. Despite of this recorded statistics none of banks in tier one has collapsed. CBK annual report (2019) asserts that banks in tier one has at least 65% of market share.

There is need to ensure that commercial banks remain as going concern since their collapse have effect on economic development. Ongore and Kusa (2013) alludes that sustainability of commercial banks have contagions to issues associated with financial crisis. Surprisingly, commercial banks in tier one records profit growth while those in lower tiers have persistently being making losses. Performance of commercial banks is dependent on its capacity to create and lend loans though Kariuki (2013) calls for due diligence prior to lending to optimize performance of their performance. Recently, banks have incorporated financial innovation to provide banking services.

1.1.4 Commercial Bank Innovations and Financial Deepening in Kenya

Financial deepening arising from banking innovations has been seen to have greater potential to increase productivity in the future. A study by Kenyoru (2013) found that when institutions are properly and innovatively functioning, economic efficiency, expansion of liquidity, mobilization of resources such as saving and transfer of traditional resources for modern growth is made possible.

Bakang (2015) avers that nations endowed with developed financial systems have experienced faster economic growth. Developing nations like Kenya, financial deepening is recognized as the major tool that fosters economic development. One of the pillars for the Vision 2030 is economy. With this, the government of Kenya aims to create financial stability, promote more credit and increase financial services and products. Financial deepening ought to be an ongoing process with continuous effort meant to enhance economic growth. Hence the need for continuous studies to countercheck whether the country is still on

the right course of spurring the economy. In the light of this backdrop the study endeavours to establish the effect of commercial banks innovations on financial deepening in Kenya.

1.2 Statement of the Problem

Commercial banking services are important as of a means of access and store of wealth. One major problem with the banking sector in Kenya is the limited financial services access. Despite the advancement in banking innovations to enhance future growths, the effect created by banking innovation on financial deepening is still not clear.

Most studies have examined banking innovations and financial deepening for all commercial banks in Kenya. Kenyora (2013) investigated the impact of financial innovation on financial deepening in Kenya though it was skewed on regulatory framework. It revealed positive impact of financial innovation on financial deepening. Ngii (2013) reported positive and significant effect of mobile banking on banking performance. Kisaka, Ndi, Muriuki and Muio (2015) and Kathuo, Rotich and Anyango (2015) reported positive and significant effect of innovation on banking performance.

There is no conclusiveness in past empirical studies since some have reported significant or not significant findings. These differences can be attributed to methodological approach, conceptualization and time the specific study was undertaken. Methodologically, most studies have considered each banking innovation in isolation of others as compared to this study which will consider internet banking, mobile banking, agency banking and ATM banking as determinants of financial deepening of tier one commercial banks. Also, some studies have adopted use of primary data as compared to this study which will use panel data.

There are alternative measures of financial deepening which past studies has adopted which may have led to non-homogeneity of study findings. Moreover, most studies have considered all commercial banks licensed in Kenya as compared to current which will draw its data from tier one banks. Furthermore, there have been operational differences among different scholars unlike the current study that will adopt volume of transactions in mobile, agency, ATM and internet adoptions. Other scholars had adopted heterogeneous measures which were contingent to data availability. Consequently, the study seeks to examine the effect of tier one banking innovations on financial deepening in Kenya.

1.3 Research Objectives

1.3.1 General Objective

The general objective of the study was to establish the adoption of financial innovations by tier one commercial banks and financial deepening in Kenya.

1.3.2 Specific Objectives

The specific objectives were: -

- i. To determine the effect of tier one mobile banking adoption on financial deepening in Kenya.
- ii. To establish the impact of tier one agency banking adoption on financial deepening in Kenya.
- iii. To assess the outcome of tier one ATM banking adoption on financial deepening in Kenya

- iv. To determine the results of tier one internet banking adoption on financial deepening in Kenya

1.4 Hypotheses of the Study

The study sought to test the following hypothesis: -

H₀₁: There is no significant effect of tier one mobile banking adoption on financial deepening in Kenya.

H₀₁: There is no significant impact of tier one agency banking adoption on financial deepening in Kenya.

H₀₁: There is no significant outcome of tier one ATM banking adoption on financial deepening in Kenya.

H₀₁: There is no significant result of tier one internet banking adoption on financial deepening in Kenya.

1.5 Significance of the Study

The findings of the study may be of benefits to the following persons or bodies: This study may benefit the banks managers who are keen on checking the impact being created by their activities in the company. It may also help banks to benchmark on the output of financial innovations they have engaged in. Study on banks innovation is of utmost importance in the banking industry where many saving and credit cooperation managers are yearning to be in few years. This may help them to know what to expect to find and also give them a chance to reflect on what they will be bring to the market that is unique of other banks.

Banking regulator may be better placed to understand measures to be adopted by commercial banks as they pursue innovation. Further the study will reveal whether innovations are in line with the regulator desire in terms of financial deepening. Government and more so the legislative arm may be able to know the regulation to enact regarding banking innovations. This study also serves as eye opener to which innovations is coming to the aid of the bank and which is not.

Current study may study the trends in innovation and thereby exposing any existing opportunities that may come about when new innovations are discovered or developed. By so doing it may direct investors on the right direction to take. For the members of the public who would wish to understand deeply about the current banks innovation may have that chance.

Future scholars may benefit through methodological contribution by adoption of panel data to examine effect of tier one banking innovations and financial deepening after promulgation of constitution in 2010. Conceptually, joint examination on the effect of tier one banking innovations may aid in ranking banking as per their effect on each banking innovation on financial deepening.

1.6 Scope of the Study

The study covered all the tier one commercial banks in Kenya. A census of the six tier one banks was adopted and secondary data collected over eight years from 2010 to 2018. The choice of the time was guided by the fact that in 2010 Kenya promulgated a new constitution and there was anticipation of creation of new business environment which could trigger

innovations in all sectors. There could be other forms of bank' s innovations, but the study may lay its main focus on mobile banking, agency banking, automated teller machines and internet banking. The study made use of secondary data since it is the reported data readily available. The source of secondary data was sourced from audited and published banks financial statements, the Central Bank of Kenya (CBK), the Kenya National Bureau of Statistics (KNBS) and some directly from the banks. The study was carried out in Nairobi County since it has the headquarters for both CBK and KNBS from the month of January 2020. The banks in tier one was selected since all had incorporated the four financial innovation in provision of banking services. Hence, it was appropriate to examine co-movement between financial innovation and financial performance of tier one banks.

1.7 Organization of the Study

The proposal comprises of preliminary pages and three chapters. In the preliminary pages, declaration, acknowledgement, table of contents, list of figures, list of tables, abbreviations and acronyms, operational definition of terms and abstract are presented. Chapter one involves background of the study, statement of the problem, purpose of the study, objectives of the study, research questions, and significance of the study, scope of the study and organization of the study. Chapter two literature reviews examine both theoretical and empirical review; under theoretical review the study is pegged on innovations diffusion theory and theory of financial deepening. In empirical review, the nexus between independent and dependent variables will be discussed while under the conceptual framework study variables are operationalized. Chapter three deals with research methodology, research design, data collection tools and data processing and analysis will be

discussed in detail. Chapter four has findings and discussions. Descriptive, correlation and inferential statistics findings and interpretations are presented. Chapter five has conclusion, recommendations and suggestions for future studies.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter in detail relates the study objectives with the past theories, studies that have been carried and are trying to explain what was found about study variables. Together this chapter holds the presumed relationship between researched variables. The nexus between study variables as documented in past studies were explored. Therefore, the two major sections of this chapter are theories and empirical frameworks and summary thereof.

2.2 Theoretical Framework

In this section' s theories explaining the presumed relationship between bank innovations and financial deepening are discussed from the past research work.

2.2.1 Theory of Diffusion of Innovations

Diffusion of innovation was proposed by (Rogers, 1962). Diffusion is understood to mean the way in which individuals or members of public adopt innovation and approves it (Ngii, 2013). The theory of diffusion is made up of other sub theories which in one way try to establish the process of adoption. To begin with, the most famous recording of diffusion of innovation was studied by French sociologists, Tarde and Parsons in 1903. Tarde and Parsons posited that innovation takes an S-shape curve in adoption. In 1943, Ryan and Ross added to the same theory of diffusion of innovation. However, the recent development by

Rogers in 1995 is widely recognized as it tried to put together all views of these sets of sub-theories.

The theory is appropriate for the study since there is need for examination of value contribution to be derived from alternative banking innovations. This is because banking innovations are capital intensive and their need for surety on capacity of banks to recoup their initial investment. This can be achieved through financial deepening which would trigger market penetration into regions which were not previously accessed by respective banks. Through innovation its anticipated that commercial banks would be better place to serve more customers or develop new products.

2.2.2 Theory of Financial Deepening

As proposed by Mckinnon (1973) and Shaw (1973) theory, financial deepening will thrive well where there is financial liberalization in the financial sector which is observed when there is financial development that eventually led to economic growth. Theory of financial deepening tends to explain the reason behind atomized financial systems, which is experienced when financial system, exists largely without financial repression (Nnanna & Dogo, 1998). Financial deepening comes from adoption of necessary and real financial policy such as real rate of returns to real stock of finance (Kisaka *et al.*, 2015). In opposition, shallow financial systems are seen to be caused by changes in the relative process of finance. Therefore, presence of active financial intermediation ensures growth and financial deepening in many sectors. Specifically, when the process of financial intermediation is carried out innovatively, that is, where there are new products and services being generated

day in day out. This further ensures that monetary systems are increasing to yield more opportunities that are profitable to enter into business (Shaw, 1973). As per the said theory, financial deepening through productive investment encourages growth. As Friedman (1998) found out, this connection between growth and financial deepening points to the positive impact created on financial liberalization.

Several literatures have pointed to the benefits that are enjoyed by countries whose financial development is massive (Levine (1997a; Demirguc, Kunt & Levine, 2008; 2009). Kisaka *et al.*, (2015) also avers that in a vibrant, dynamic, and well-functioning financial sector there are numerous improvement economy wise. McKinnon (1973) and Goldsmith (1969) hypothesized that economy development would be achieved to a greater extent in areas where banks are free of repressive controls as exercised in interest rate caps and quantities predominant during at olden time. Since those old days, financial systems have recognized the role of banks in conducting four basic functions important to the economic growth, namely accumulation of savings, allotting resources through lending to most profitable zones, facilitating transactions and risk management, and exercising corporate control (Kisaka *et al.*, 2015). Thus, if the highlighted functions are carried out in conducive environment, more and more development will be realized that would accelerate growth rate to higher heights.

2.3 Empirical Review

Empirical review will present nexus between independent and dependent variables. Alternative research gaps will be identified and how the current study will bridge them will be detailed.

2.3.1 Mobile banking and financial deepening

Mobile phones have offered conveniences services to an extent that institutions aiming to grow and expand rapidly would find them inevitable (Kisaka et al., 2015). Descriptive research design was adopted. This weakness was attributed to fear for the full transfer of the services to digital platform due to security that would expose banking system to outside shocks that would have transferal. However, over time this has improved hence many banks adopted mobile banking that included almost their services. Lewis (2012) study too pointed that for the competition reason, banking industry is forced to adopted technology so as to reach the high level of unbanked individuals who are geographically far. Technology in the mobile phones is seen create a separation between the most successful and less successful banks (Lewis, 2012). A weakness with Kisaka et al., (2015) study was that there was shift in focus from the commercial banks in Kenya to the banking services as rendered by the telecommunication companies.

Kathuo et al., (2015) conducted an exploration on impact of the mobile banking on performance of 42 commercial banks registered in Kenya. Through the use of questionnaires issued to 180 management staffs selected from 42 commercial banks, data was collected which showed that many banks have moved into mobile platform which has enabled them

reach out many customers. Further, measure of mobile banking including fund transfer accounts, bill payment, bank statements and cheque book ordering were the common banking products regularly used showing that banks role of financial performance is carried on well. The study heavily relied on the primary data which to some extent did not give the countries outlook as compared to the reported performance. This study will counter this problem by use of content analysis from the published reports based on similar factors.

Ngii (2013) studied how mobile phone telephony innovations influence financial depth of the banking industry in Kenya using for the year 2008 to 2012. M-banking was assessed via the number of persons registered for the services, volume of transactions and deposits mobilized on this platform while total deposits for the commercial banks as a percentage of GDP was used as measure of financial depth. As technology advanced from 2008 to 2012, the percentage of m-banking explaining financial deepening kept on escalating even though not with great percentage. This is likely to change with time due to account for larger variance as shown by the trend. In bid to improve Ngii' s study there is need to check on other factors which may account for higher percentage of financial deepening. Similarly, an inverse relationship between mobile banking and financial deepening has been found by Kenyoru (2013).

The drive for mobility, Mwange (2013) too engaged to find out the role played by mobile banking on the financial performance of commercial banks in Kenya by considering a five-year period starting from 2008. Mobile banking was assessed by investment made in m-banking, number of registered m-banking customers and number of mobile banking transactions while performance of the banks was measured by Return on Assets (ROA).

Employing a causal research design and extracting data from published reports by individual banks and CBK, it was established that mobile banking had a positive correlation with bank performance. Similar findings were recorded by Mwangi (2014) who used data for 7 years and applied multiple regressions to model their time series data. Notably, despite realization of data to be time series, the researcher did not apply times series analysis tool.

2.3.2 Agency banking and financial deepening

In a bid to establish the reasons that affect uptake of agency banking by the commercial banks in Kenya, Maina and Mwangi (2014) referred to three major issues, namely security, liquidity availability and customer awareness as the hindrances. In their research they adopted a descriptive research design and unit of measures being the customers in Kenya commercial bank (KCB). A sample of 497 respondents was taken by use of stratified sampling techniques. Agency banking was assessed by the services rendered to customers. After use of probit analysis, results highlighted security and lack of float and cash (liquidity) were the major reasons why the uptake. As realized this study was a case study focusing only on six KCBs within Nairobi Central Business District. As per this study it will not only cover all the registered commercial banks in Kenya but also investigate how agency banking has influenced deepening of the financial sector.

A study by Barasa and Mwirigi (2013) documented the role played by agency banking in deepening the financial sectors. Using a sample of 40 registered agents and 400 persons, data was gathered systematically and analyzed by descriptive tools. The results indicated that agency banking actually played a key part in enhancing penetration of banking services for

the unbanked person and in remote areas where establishment of bank would take long due to population. It was also said through agency banking customers were able to gain access to almost all the banking products. As it necessary for financial deepening, use of agent had enabled customers or beneficiaries to enjoy conversion of electronic money into cash and vice versa thus forming a backbone of the electronic money transfers. Unlike this study that collected data only from four commercial banks agent outlets, the current study endeavours to use details of transactions as shown by the CBK to give a holistic picture of the commercial bank' s transactions in the country.

Munoru (2016) studied the impact created by having agency banking on commercial banks financial inclusion. Taking a sample of 13 banks, agency banking was measured by amount of cash deposits through this channel, payment of retirements and social benefits to customers, number of bill payment and number engaged in this channel. On the other hand, financial inclusion was assessed by the percentage of adult with bank accounts. The results indicated that there is strong relationship between agency banking and financial inclusion hence should be an idea that should be recommended for all commercial banks. Several other innovations have taken place which seeks to have effect on financial sector, however this study concentrated on agency banking thus this study will be current will be unique by exploring based on Munoru (2013) understanding.

Mwende, Bichanga and Mosoti (2015) in a case study of Equity banks in Kitui central districts investigated the functionality and contribution of agency banking in Kenya. The study used a descriptive survey design on a sample six equity agents having 100 equity bank account holders. The results showed that agency banking saved on costs, times and gave

access to most of the banking products. However, there was need to advertisement the services offered by agents for their popularity. The study only covered a small region and as recommended by the research there ought to be other studies that should give a wider picture. Other banks that have engaged in agency banking should then be included for clarity as well in mode of administration. Possibly one of the greatest benefits of agency banking in Kenya is the transfer of banking products and services to regions where until now would have been go on unbanked for a long period of time (Barasa & Mwirigi, 2013).

Further, Ogetange (2014) researched on the agency banking. Ogetange established that agency banking is branchless banking just like ATMs and mobile banking the only requires mobile phones or Point of Sale (POS) card reader and pin pads. This study assessed performance of the bank by Return on Assets (ROA) and Return on Equity (ROE). Significantly, agency banking has been found to continuously increasing the financial performance. However, it should be noted that agency banking come with its own costs including compliance costs, registration bureaucracy, taxation cost and many more.

Mwai, Njeru and Memba (2019) investigated moderating effect of firm size on relationship between financial innovation adoption and financial deepening of listed commercial banks. Expo facto research design as adopted and secondary data gathered over five years for 12 listed commercial banks. Descriptive and inferential statistics analysed the data. Study findings indicated that there positive and significant relationship between mobile banking, agency banking, ATM banking, internet banking and financial innovations of listed commercial banks in Kenya. Further, bank size had significant moderating effect on the

relationship between financial innovations adoption and financial deepening of listed commercial banks in Kenya.

2.3.3 Automated Teller Machine banking and financial deepening

Atavachi (2013) explored financial performance as influenced by electronic banking such as adoption of Automated Teller Machines (ATMs) for the Microfinance Institutions (MFIs) in Kenya. A descriptive research design was employed to investigate 9 registered MFIs. Contrary to extant theories and presumed benefits that come with electronic banking, it was established that e-banking had inverse relationship with financial performance. This Atavachi (2013) attribute to increase in other bank innovations such as agency banking which could be undermining usage of ATMs in many areas.

Akhisar, Tunay and Tunay (2015) assessed the role played by electronic banking innovations on bank performance. Using data from 23 developed and developing nations on internet banking and with a time series data from 2005 to 2013, panel data methods (fixed /random effects) were used. Electronic banking was assessed by number of ATMs while banks performance was indicated by ROA and ROE. Data was sourced from World Bank development indicators and international monetary funding (IMF). Findings of the study depicted that high level of significance even though some variables contrasted the expected negative relationship because of diversity in the development, socio-culture and infrastructure under which banks trade on.

Jegede (2014) also sought to examine effect of ATM on performance of Nigerian banks. This was informed by the desire to move away from virus technology to secured chips cards that

are free from credit/debit frauds. Data was collected by use of questionnaires issued conveniently to a sample 125 employees of five banks in Nigeria capital city. The results of the analysis showed that deployment of ATMs terminals had improved averagely the performance of banks. Maximum benefits were not reaped due to increased ATM frauds. Thus, to reap maximum banks have to improve security in bid to subvert the tricks used by fraudsters.

One of the major reasons why banks in Nigeria are investing heavily in ATMs is to try and increase efficiency. To ascertain whether in deed there is improvement in efficiency, Adewoye (2013) studied the impact of ATMs investment on banks cost efficiency. The study incorporated 20 listed banks whose financial reports for six years were surveyed. The intensity of ATMs was found to have a significant impact and positive contribution to the cost efficiency- as measured by operating cost rate and asset management cost rate. As Adewoye (2013) further report, ATMs serves as teller labour substitution which lower the personnel expenses and pressure for a given bank.

Danlami and Mayowa (2014) too studied the effect of ATMs on customer satisfaction in Nigeria, Kwara state focusing on only three purposively selected CB. Using a sample of 180 account holders who were selected randomly, it was established that there was a significant relationship between ATMs usage and customers' satisfaction. However, the research also found that there was need to do away with restriction on cash withdrawals by customer in a given day, for the full satisfaction. The study also pointed to some key areas that banks that aims to install ATMs need to observe; power failure, network failure, restriction on ATM

withdrawals, poor connectivity, inadequate ATMs and shortage of ATM experts. Any innovation around ATMs should seek first to mend these problems.

2.3.4 Internet banking and financial deepening

Njogu (2014) studied the impact of internet banking on the commercial bank (CB) customer deposits in Kenya. The study adopted a descriptive survey design to report on all the 43 commercial banks from year 2009 to 2013. Internet banking was weighed by the number of customers who transact using internet sources from the CB, volume of transaction handled via internet and deposit mobilized via internet transactions such as electronic fund transfers while customer deposits was checked in using domestic credit provided by banking system using internet channels as proportion of GDP. Even though the data was a time series in nature, multiple linear regressions was used to analyse the data. A statistically positive and significant relationship was found between the two variables. Due to the error in the model used to analyse, the current study serves to correct this methodology as well check the impact of internet banking on financial deepening.

A descriptive exploration into internet banking was further conducted by Ngungi (2013) in Kenyan commercial banks. Including all the 43 registered banks, a census was also carried out to extract information from annual reports and issue of questionnaires. Using multiple regression, it discovered that although there was a weak positive relationship between online banking and banks financial performance, it was significant. This would be explained by online banking impact in cutting costs, increase in commission income and reduce staffing levels which was expected in the initial stages. According Ngungi (2013) internet banking is

being used as marketing for customer satisfaction while expanding market to unbanked individuals as well as improve service quality and intensity of banking products. There need for time series data that can be used to compare whether there is any change in the financial depth which is what the current study endeavours to expound on.

Conversely to the previously discussed study, Masila (2013) examination of internet banking on performance of retail banking found that increase and well enhanced internet connection in banking has added another channel for marketing banking products and services. Further internet banking has resulted in improved performance of CB in Kenya. This could be explained by the improved efficiency in rendering services to customers who find it easy to adapt to the technology advancement.

To add to this, Wanja (2014) avers that there is absolute need to invest in technological innovations to generate more and more customer friendly applications. However, Wanja warns that with continued awakening of internet usage, policy maker ought to be keen with their role lest they lose it over the internet. Nzioka (2014) posits that the undeniable benefits received by use internet banking cannot be always obvious owing to reverse causality on financial performance. Holding to the same statement Oyewole, Abba, El-Maude, Gambo & Abam (2013) in Nigeria points that investment decision on electronic banking need to be rational for cost justification and revenue impact.

Sumra, Manzoor, Sumra & Abas (2011) in Pakistan investigated effect of electronic banking on the profit made by commercial banks. Employing descriptive and explanatory survey design and interviewing managers of 12 domestic and foreign bank demonstrated that

electronic banking was an important accelerator of profits. Further, electronic banking is seen to enable realization of reduced costs and earned profits with a short duration.

Mwale, Jagongo and Ndede (2019) investigated the effect of internet banking on financial performance of tier one commercial banks in Kenya. The study adopted descriptive research design and primary data was collected through administration of questionnaires. Univariate and multivariate techniques analysed the data. Internet banking positively affected performance of tier one commercial banks. Rather than collecting primary data the study should have adopted secondary data.

2.3.5 Measuring Financial Deepening

The depth of financial may be interpreted to have three set of meaning. To start with, it means environment where sectors and agents can trade in several financial instruments to make savings, investment and insurance decisions both for long term and short terms. A second meaning is gotten when role of intermediation is practiced with larger volumes of capital and handle larger turnover, without necessitating large corresponding movements in asset prices (Ngii, 2013). Final meaning reflects financial sector which is able to create a broad menu of assets for risk diversification. Simply put, markets where savers investment and do risk diversification while allowing borrowers to likewise tap a broad range of financing and risk management instruments (Goswami & Sharma, 2011).

According to Bakang (2015) financial deepening can be shown by indicators such as liquidity liabilities as ratio to nominal GDP; credit to private sector as ration to nominal GDP; commercial bank assets as ratio to commercial bank assets plus central bank assets;

and commercial bank deposits as ratio to nominal GDP. The result of Bakang (2015) study showed that these measures were statistically significant against the measure of the economy. There is therefore need for those banks that want to increase their financial depth reinforce existing policies to encourage more savings which subsequently increases interest paid to depositor. Mwangi (2014) posited that financial deepening can also be assessed by checking in the ratio of money supply to GDP, ratio of the value of stock to GDP and/or ratio market capitalization to GDP on top of those suggested by Bakang (*inid*).

2.4 Summary of Literature and Research Gaps

As realized from the theoretical review, diffusion theory tends to explain how innovative ideas are communicated over time through several means. This theory documented that innovation is indispensable process that explain the success of many organisations. In particular, it is worthy and good to note that technology adoption will actually depend on five things; relative advantage, compatibility, complexity, reliability and observability. Theory of financial deepening puts across how financial repression fails to contribute to growth in banking institutions. This theory further has posited that liberation in the financial sector enables automatized financial systems that can be accessed all over. Experimental evidence documented has shown how innovations and financial performance or financial deepening are related. Even though different type of the relationship is expressed, a gap to be confirmed in Kenyan context is revealed. Notably, mobile banking, internet banking, use of ATMs and agency banking have been realized to be major banking innovations that influences financial depth.

Table 2.1 Summary of Literature Review and Research Gaps

Author	Research Topic	Research Findings	Research Gaps	Focus of the Current Study
Kisaka <i>et al.</i> , (2015)	The relationship between mobile banking deepening and financial performance of commercial banks in Kenya.	Positive and significant weak relationship between financial deepening and financial performance	Concentrated more on financial services rendered by telecommunication companies rather than commercial banks	With focus on the effect of financial deepening on commercial banks in Kenya.
Kathuo <i>et al.</i> , (2015)	Effect of mobile banking on the financial performance of banking institutions in Kenya.	Positive relationship between mobile banking and financial performance	Relied on the primary data which to some extent did not give the countries outlook as compared to the reported performance.	This study countered this problem by use of content analysis from the published reports based on similar factors.
Atavachi (2013)	Effect of electronic banking on financial performance of deposit taking micro-finance institutions in Kenya	There was an inverse relationship between e banking and financial performance	The study relied on cross sectional data thus regression modeling was not the most appropriate to analyse the data	The current study adopted panel data thus it was appropriate to test the causal effect between electronic banking and financial performance.
Jegede (2014)	Effects of Automated Teller Machine on the Performance of Nigerian Banks	There was positive relationship between electronic banking and commercial banks performance	Although the study adopted use of primary data. Regression analysis was used to analyse the data even though it was not the most appropriate	Currently panel data was adopted to examine the causal relationship between electronic banking and commercial bank performance
Barasa and Mwirigi (2013)	The role of agency banking in enhancing financial sector deepening in emerging markets: lessons from the Kenyan experience	Positive and significant influence between agency banking and commercial banks performance	The study drew cross sectional data from only four commercial banks.	Currently secondary data will be drawn amongst all tier one commercial banks over an eight-year period.
Munoru	Effect of agency banking on	Positive influence of	Reliance on primary data	Use of secondary had a better

(2016)	financial inclusion in Kenya.	agency banking on commercial banks performance	compromised measurement scale of agency banking	measure of agency banking.
Njogu (2014)	The effect of internet banking on customer deposits in commercial banks	Positive relationship was reported between internet banking and commercial banks performance	Reliance on ordinary least squares to analyse panel data	The current study adopted panel data analysis procedure
Ngungi (2013)	Effect of online banking on financial performance of commercial banks in Kenya	Positive relationship between internet banking and financial performance	Reliance with cross sectional data compromised the scale used to measure online banking.	The current study adopted secondary data which had superior measure of online banking.

Source (Author, 2021)

2.5 Conceptual Framework

Banks innovations as seen in the background have taken different shapes. This study focuses on the major four innovations; mobile banking, agency banking, ATM banking and Internet banking. According to Mugenda and Mugenda (2009) conceptual framework is a diagrammatic representation that illustrates relationship between the study' s independent variables vis-a-vis the dependent variable. Concepts need not only to be discussed but to be drafted for their understanding, hence conceptual framework represents a tool to enhance understanding of the study variables. As per this study subject on effect of bank innovations on financial deepening in Kenya and the hypothesis raised, the study considers mobile banking, agency banking, ATM banking and Internet banking as the independent variables while financial deepening is taken as dependent variables. This is as shown in Figure 2.1

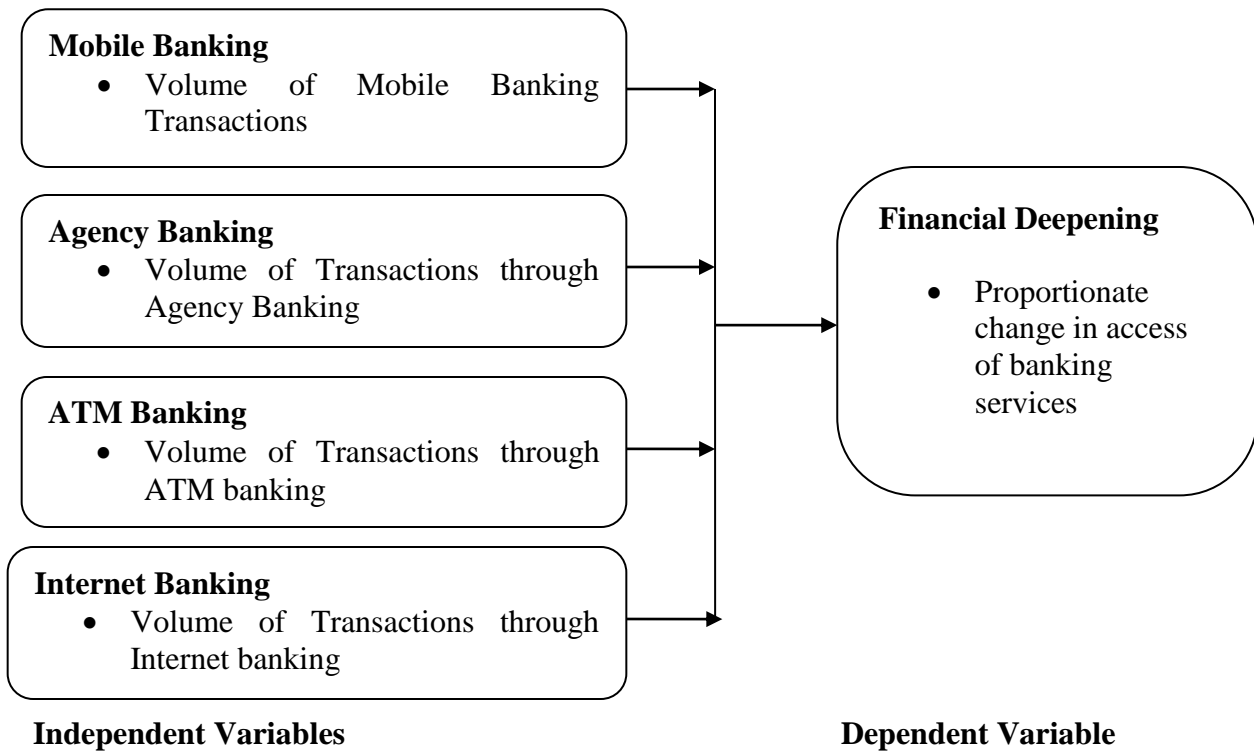


Figure 2.1 Conceptual Framework

Source Author (2021)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The current chapter research methodology, the research design, target population, sample size, data collection and data analysis will be clearly stipulated.

3.2 Research Design

Research design is a thematic guideline stipulating how the study was undertaken with the sole purpose of answering the research questions (Kombo & Tromp, 2006). In the current study the main purpose is to explain the causal effect of banking innovations on financial deepening in Kenya. Thus, the most appropriate research design was correlation research design. The choice of this design is cemented by Oso and Onen (2009) who argued that correlation research design is appropriate whenever the study seeks to establish causal relationship between study variables. Moreover, the design had been adopted in the past by (Wanjiku & Nasieku, 2015; Githira & Nasieku, 2015).

3.3 Target Population

A complete count of all individuals or elements under consideration is known as target population (Kothari, 2011). Empirical examination was limited to only six tier one commercial banks. In the current study the target population composed of six banks in tier one. Panel data was collected over eight-year period from 2010 to 2018.

3.4 Sampling and Sample Size

Census approach was adopted since there were only six commercial banks in tier one in Kenya at the time of this study. Panel data was collected over eight years from annual financial statements of respective commercial banks. The total number of panel data was 48.

3.5 Data Collection Instrument

The study collected secondary data from annual financial statements of listed commercial banks in CBK, KNBS and communication authority of Kenya reports. Panel secondary was collected using Document Check Index (DCI), this has dominated other studies (Ndili & Muturi, 2015; Wangechi & Nasieku, 2015; Nduta & Muturi, 2015; Githira & Nasieku, 2015; Tarus & Omandi, 2013). The DCI consisted of five sections which are mobile banking, agency banking, automated teller machine banking, internet banking and financial deepening. Reliability of the research instrument was examined through use of past empirical evidence that supported use of adoption of online banking, mobile banking, ATM and agency banking as innovations aimed at enhancing financial deepening. Validity was examined through discussion of the research instrument with the supervisor and statistician.

3.6 Reliability of Research Instrument

Reliability of research instrument is an examination of the odds of yielding consistent findings is research tools is administered in different groups (Oso & Onen, 2009). Reliability of the research instrument was examined through use of Cronbach Alpha coefficients.

According to Saunders et al., (2014) if the reliability coefficient is at least 0.7 then the research instrument is reliable.

3.7 Validity of Research Instrument

Validity examination is an examination of the research instrument to ensure that it measures what it is expected to. Sekaran and Bougie (2013) that validity is the level in which research tools evaluates what it purports to be measuring. Validity was achieved through discussion of research instrument with supervisors and panel during proposal presentation. Moreover, the research tool was discussed with a statistician to authenticate there are were minimal odds of fitting spurious regression model.

3.8 Data Analysis

The quantitative data collected was analysed by descriptive statistics such as mean and standard deviation using Stata version 14. Inferential statistics were applied and included Product moment correlation coefficient for strength evaluation and regression modelling for nature of effect evaluation. According to Oso and Onen, (2009) the p value of an independent variable is compared with 5% and if it is less than 5% then there is enough evidence to reject the null hypotheses. P value is used as a benchmark for rejecting the null hypotheses when it true (Sekaran & Bougie, 2013). If there are more than one independent variable in a study then the most appropriate analysis procedure will be multiple regression analysis (Muchiri, 2016). Therefore, the current study fits the current analysis procedure. The regression model is as illustrated:

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \varepsilon$$

Where;

Y = Financial Deepening

β_0 = Constant

β_i = is the coefficient for X_i (Where $i = 1, 2, 3, 4$)

X_1 = Mobile Banking; X_2 = Agency Banking; X_3 = Automated Teller Machine Banking; X_4 = Internet Banking; ε = Error term

3.9 Variables Definition and Measurement

Table 3.1 Operationalization of Variables

Variables	Measure	Scale
Independent Variables		
Mobile banking (X_1)	Mobile banking transaction volume amount	Interval
Agency banking (X_2)	Volume of transactions through agency banking amount	Interval
ATM banking (X_3)	Volume of transaction handled by ATMs amount	Interval
Internet banking (X_4)	Deposit mobilized via internet transactions amount	Interval
Dependent variable		
Financial Deepening (Y)	Ratio of change in access of banking services	Interval

Source: (Kathuo *et al.*, 2015; Kisaka *et al.*, 2015; Munoru, 2016; Danlami & Mayowa, 2014; Njogu, 2014; Okfar *et al.*, 2016; Karimo & Ogbonna, 2017; Ho *et al.*, 2017)

3.10 Diagnostic Tests

Regression analysis is based on several assumptions such as linearity, random sampling, error term has zero mean and homoscedasticity (Kothari, 2011). Although, there error term and independent variables are assumed to have zero correlation, it is hard to prove it with certainty (Baltagi, 2005). Since the data will be panel in nature the study will have a choice among pooled effects ordinary least squares model, random effect model (REM) and fixed effect model (FEM).

3.10.1 Normality

In regression modelling study variables are assumed to be normally distributed. Normality of variables can be evaluated through graphical or statistical approaches. Graphical methods include PP plots, QQ plots and histograms. Statistical methods include Kolmogorov-Smirnov test, Jarque Berra among others. These tests assume that the data is normally distributed against an alternative hypothesis that the data is not normal. At 5% level of significance if p value is less than 0.05, then the data is not normally distributed and there is need for its transformation prior to modelling (Saunders *et al.*, 2014).

3.10.2 Stationarity

Stationarity is a condition in time series and panel data not to have similar statistical properties with the time under consideration (Hyndman & Athanasopolous, 2018). In this study stationarity was examined through application of inverse chi squared, inverse normal, inverse logit and modified inverse chi squared. The null hypothesis was that the data was not stationary against an alternative of stationarity. The hypothesis was tested at 5% level of significance.

3.10.3 Multicollinearity

Multicollinearity is a condition in which independent variables are highly correlated. It was tested using Variance Inflation Factors (VIFs) and tolerance limits. According to Wooldridge (2013) if VIFs exceeds 10 or tolerance limits are less than 0.1. Then there in multicollinearity and it can be corrected through dropping of variables and model respecification.

3.10.4 Serial Correlation

Serial correlation or autocorrelation is the condition in which the error terms of current period are correlated with past period (Baltagi, 2005). Serial correlation can lead exaggerated model goodness of fit, inefficient estimates, small standard errors and large T statistics (Wooldridge, 2012). In this study serial correlation was tested with a null hypothesis that there is no serial correlation against an alternative that there is serial correlation. At 5% level of significance the hypothesis would be rejected, and presence of serial correlation managed through fitting Feasible Generalized Least Squares (FGLS) model or a model with robust standard errors (Baltagi, 2005).

3.10.5 Heteroskedasticity

Heteroskedasticity is a violation of an assumption that variance of error terms is constant (Hyndman & Athanasopolous, 2018). Presence of heteroskedasticity leads to least squares model that is not best linear unbiased estimator and wrong standard errors. Heteroskedasticity can be detected through use of residual plots, use of Breusch Pagan (BP) test. BP tests a null hypothesis that the error is homoscedastic against an alternative that its heteroskedastic. If p value is less than 0.05, at 5% level of significance then there is heteroskedasticity. It can be resolved through use of robust standard errors or Feasible Generalized Least Squares.

3.10.6 Granger Causality

Granger causality is an examination that variables under examination has relationship with each other. According to Woodridge (2012) if two variables granger cause then the information of one can be used to explain the other. Granger causality can be unidirectional, and bidirectional. It is bidirectional if two variables have p values less than 0.05 and unidirectional if only one has p value less than 0.05. Otherwise, there is no granger causality.

3.10.7 Hausman Test

A Hausman test will be carried out to decide on the mutually exclusive model to apply between FEM and REM (Baltagi, 2005). If the Hausman test fails to reject the null hypothesis, the random effects model is the one that is the most appropriate to use to estimate the regression. A failure to reject the null hypothesis means that the sampling variation in the fixed effects estimates is too large, it would not be possible to conclude any differences that are statistically significant. Another reason can be that the estimates are so close that it does not matter which one to use.

FEM is more appropriate whenever the study seeks to examine dependent and independent variables which vary with time. In this approach, the main assumption is that each entity has unique characteristics which will have no relation with independent variables. In addition, there is need to control the effect of some variables which may have biased effect on independent variables. In this approach the influence of time invariant features allows for an examination of the net effect of each independent variable on the dependent variable.

Although, both error terms and independent variables are assumed to be not correlated, if any correlation is noted then FEM is not appropriate to analyse the data (Baltagi, 2005).

The logic behind the suitability of REM is hinged on recording of differences amongst entities which are uncorrelated and random. This implies that there is no association between error terms and independent variables (Baltagi, 2005). Therefore, time invariant amongst variables plays a greater role in modelling as an independent variable. Thus, when differences are recorded among the entities and the response variable, then REM is the most appropriate model to fit the data.

3.11 Ethical Considerations

Cover letters will be affixed to the secondary data collection sheet explaining the nature of the study and assuring the respondents confidentiality provided. The respondents were also given instructions on how the data collection sheet ought to be filled. All source documents relied on in the study were properly acknowledged and referenced. Upon completion of the study, the study data was destroyed and in all instances codes were used while identifying banks.

CHAPTER FOUR

EMPIRICAL RESULTS, INTERPRETATIONS AND DISCUSSIONS

4.1 Introduction

This chapter presents the study findings that were obtained from data analyzed. The main objective of the study was to investigate the adoption of financial innovations by tier one commercial banks and financial deepening in Kenya. Specifically, the study examined the adoption of tier one mobile banking, agency banking, ATM banking and internet banking. Descriptive statistics and inferential statistics were adopted for data analysis. Moreover, diagnostic tests were carried prior to modelling.

4.2 Descriptive Statistics

Descriptive statistics was applied to show mean, standard deviation, Skewness and flatness of secondary data used in the study. Study findings are summarized in Table 4.1.

Table 4.1 Descriptive Statistics

	Financial Deepening	Mobile banking	Agency Banking	ATM Banking	Online Banking
Mean	16.61	16.46	20.18	19.41	20.88
Median	15.54	14.92	20.43	19.21	22.36
Maximum	42.70	30.30	28.05	29.75	30.19
Minimum	1.20	13.04	10.14	8.78	12.05
Std. Dev.	9.49	4.29	2.98	3.22	3.95
Skewness	0.82	1.78	-1.19	1.17	-0.50
Kurtosis	3.27	5.10	7.03	8.40	2.92
Jarque Bera	5.48	34.20	43.81	69.15	2.00
Probability	0.06	0.00	0.00	0.00	0.37
Sum	797.31	790.30	968.66	931.60	1002.31
Sum Sq. Dev.	4233.87	865.87	418.47	486.18	732.54
Observations	48	48	48	48	48

As shown in Table 4.1, the mean financial deepening was 16.61 percent which indicated that access to banking services increased by almost 17 percent per annum amongst commercial banks in tier one from 2011 to 2018. The minimum growth rate was 1.20 and a maximum of 42.70 which indicated wider variations among tier one commercial banks. This variation could be attributed to strategies by respective banks to provide banking services. The mean of tier mobile banking was 16.46 units per annum with a maximum of 30.30, the standard deviation was 4.29 units. Agency banking recorded mean of 20.18 units with minimum of 10.14 and standard deviation of 2.98 which was the least among independent variables.

The mean of ATM banking was 19.41 with maximum of 29.75 and minimum of 8.78 and skewness coefficient of 1.17 which indicated most banks in tier one had incorporated use of ATM banking services. Online banking had mean of 20.88 with minimum of 12.05 and maximum of 30.19 with a standard deviation of 3.95. The data was not normally distributed since it has Jarque Berra coefficients with p values less than 0.05. This provided enough

evidence to warrant rejection hypotheses that the data was normally distributed against an alternative that the data was not normally distributed.

Lack of normality agreed with Githira, Muturi and Nasieku (2019) who found that data from annual financial statements of listed companies in East Africa securities was not normally distributed. Increased access to financial services was in line with diffusion theory of financial innovation that argued that provision of services should change with changes in technological adoption. These was cemented by Kisaka *et al.*, (2015) who argued that financial deepening is contingent to use of mobile banking. Further, Maina and Mwangi (2014) incorporation of agency banking services has not only promoted financial deepening but supported provision of banking services in secure platforms since there is limited reliance on cash. The results were in agreement with (Lewis, 2012). From descriptive statistics there is a core movement between adoption of banking innovations and financial deepening of tier one commercial banks in Kenya.

4.3 Inferential Statistics

Inferential statistics were adopted to show causality and nature of relationship between adoption of banking innovations and financial deepening of tier one commercial banks in Kenya. Inferential statistics adopted in the study were correlation analysis to evaluate the strength of the effect of adoption of financial innovations by tier one commercial banks in Kenya on financial deepening. Regression analysis was adopted to establish the nature of the effect of adoption of financial innovations on financial deepening of tier one commercial banks in Kenya.

Regression modelling is based on assumptions of linearity, multicollinearity, normality, serial correlation and heteroskedasticity. In addition, the data being panel stationarity, granger causality and Hausman test were carried out. Stationarity is the condition in which panel data characteristics does not change with time (Hyndman & Athanasopoulos, 2018). Granger causality evaluated causality between variables under examination. Hausman test evaluated the model to be fitted between random and fixed effects.

4.4 Correlation Analysis

Product Moment correlation coefficient was adopted to show the strength of the effect of banking innovations on financial deepening of tier one commercial banks in Kenya. Findings are shown in Table 4.2.

Table 4.2 Correlation Analysis

	Financial Deepening	Mobile banking	Agency banking	ATM banking	Internet Banking
Financial Deepening	1				
Mobile banking	0.61 0.00	1			
Agency banking	0.47 0.00	0.37 0.01	1		
ATM banking	0.66 0.00	0.58 0.00	0.58 0.00	1	
Internet Banking	0.34 0.02	0.20 0.18	0.22 0.13	0.23 0.12	1

As shown in Table 4.2 there was positive and significant relationship between mobile banking and financial deepening of tier one commercial banks in Kenya ($\rho = 0.61$, p value

< 0.05). These findings concurred with Kisaka *et al.*, (2015) and Kenyoru (2013) who reported positive and significant relationship between mobile banking and financial deepening. Agency banking has positive and significant relationship with financial deepening of tier one commercial banks in Kenya ($\rho = 0.47$, p value < 0.05). The findings support Maina and Mwangi (2014) and Munoru (2016) who documented positive and significant relationship between agency banking and banking performance.

ATM banking has positive and significant relationship with financial deepening of tier one commercial banks in Kenya ($\rho = 0.66$, p value < 0.05). These findings mirror Atavachi (2013) and Adewoye (2014) who documented positive and significant relationship between ATM banking and banking performance. Internet banking has positive and significant relationship with financial deepening of tier one commercial banks in Kenya ($\rho = 0.34$, p value < 0.05). The findings support Njogu (2014) and Sumra *et al.*, (2011) documented positive and significant influence of internet banking on performance of commercial banks.

4.5 Panel Diagnostic Tests

Diagnostic tests are necessary to evaluate robustness of regression model prior to fitting it. These tests include stationary which examines the need to use lagged data, multicollinearity that examines collinearity between independent variables, and serial correlation that examines autocorrelation of error term, heteroskedasticity that examines uniformity of the error term and granger causality that examines causality between variables under examination.

4.5.1 Stationarity Test

Stationarity test null hypothesis stated that the data was not stationary against an alternative that the data was stationary. Stationarity was examined through use Inverse Chi Squared, inverse normal, inverse Logit and modified inverse chi squared. Study findings are shown in Table 4.3.

Table 4.3 Stationarity Test

Variable	Test	Statistic	P value
Financial deepening	Inverse Chi-squared	46.287	0.000
	Inverse Normal	-4.559	0.000
	Inverse logit	-5.159	0.000
	Modified Inverse chi-squared	6.999	0.000
Mobile banking	Inverse Chi-squared	57.446	0.000
	Inverse Normal	-4.464	0.000
	Inverse logit	-6.337	0.000
	Modified Inverse chi-squared	9.277	0.000
Agency banking	Inverse Chi-squared	47.678	0.000
	Inverse Normal	-4.570	0.000
	Inverse logit	-4.466	0.000
	Modified Inverse chi-squared	11.159	0.000
ATM banking	Inverse Chi-squared	67.823	0.000
	Inverse Normal	-4.837	0.000
	Inverse logit	-4.653	0.000
	Modified Inverse chi-squared	12.189	0.000
Online banking	Inverse Chi-squared	43.392	0.000
	Inverse Normal	-4.194	0.000
	Inverse logit	-4.763	0.000
	Modified Inverse chi-squared	6.408	0.000

Study findings in Table 4.3, all p values were less than 0.05 which presented enough evidence to warrant rejection of the null hypothesis and conclusion that financial deepening, mobile banking, agency banking, ATM banking and online banking were stationary at levels

hence there was no need to fitted regression model on lagged variables. These findings were consistent with Wairimu, Muturi and Olouch (2019) who found firm financial characteristics of listed non-financial companies to be stationary. Moreover, Githira, Muturi and Nasieku (2019) found firm financial characteristics of listed companies in East Africa securities to be stationary. In addition, the findings confirmed Muchiri, Muturi and Ngumi (2016) who found financial structure of listed companies in East Africa Securities Exchanges to be stationary.

4.5.2 Multicollinearity Test

Independent variables should not be related amongst themselves, otherwise they should not be jointly regressed. Multicollinearity was tested using Variance Inflation Factors (VIF) and tolerance limits.

Table 4.4 Multicollinearity Test

.	VIF	1/VIF
Mobile banking	1.996	0.502
Agency banking	1.531	0.653
ATM banking	1.527	0.655
Online Banking	1.07	0.931
Mean VIF	1.531	

Findings in Table 4.4 indicates that none of VIF exceeded 10 or tolerance limit was less than 0.1. Then there was multicollinearity among independent variables. These findings were in line with recommendations by Baltagi (2005) that if VIF are not greater than 10, then there is no multicollinearity and no need for model specification.

4.5.3 Serial Correlation Test

Serial correlation is a situation in which there is autocorrelation between current and past error terms. Wooldridge serial correlation test was adopted, and its null hypothesis stated that there was no serial correlation against an alternative that there was serial correlation. Study findings are shown in Table 4.5.

Table 4.5 Serial Correlation Test

Test	F Statistics	P value
Wooldridge Serial Correlation	1.192	0.3246

The study findings documented that there was serial correlation since p value was greater than 0.05. Hence, the study adopted regression model with robust standard errors. Similar approach was adopted by Githira *et al.*, (2019) and Wanjau, Muturi and Ngumi (2016) who fitted models using robust standard errors.

4.5.4 Heteroskedasticity Test

Classical regression modelling assumes that there is uniformity of error terms a condition referred as homoscedasticity. If this condition is violated, then there is heteroscedasticity. Heteroscedasticity was tested using Modified Wald test that assumed that the error term was homoscedastic. Study findings are in Table 4.6.

Table 4.6 Heteroskedasticity Test

Test	Chi square	P value
Modified Wald Test	5.75	0.4516

There was no heteroscedasticity hence since the p value was less than 0.05. These findings were incongruent to Githira *et al.*, (2019a) and Wanjau, Muturi and Ngumi (2018) who documented that there was heteroscedasticity in financial data of listed companies in East Africa Securities Exchange, hence they fitted regression models using robust standard errors.

4.5.5 Granger Causality

Granger causality was carried out to examine causality between adoption of mobile banking, agency banking, ATM banking, online banking and financial deepening of tier one commercial banks in Kenya. Study findings are in Table 4.7.

Table 4.7 Granger Causality

Null Hypothesis:	F-Statistic	Prob.
Mobile banking does not Granger Cause financial deepening	0.335	0.718
Financial deepening does not Granger Cause mobile banking	1.929	0.165
Agency banking does not Granger Cause financial deepening	0.347	0.710
Financial deepening does not Granger Cause agency banking	0.577	0.569
ATM banking does not Granger Cause financial deepening	0.896	0.420
Financial deepening does not Granger Cause ATM banking	1.023	0.373
Online banking does not Granger Cause financial deepening	1.163	0.328
Financial deepening does not Granger Cause online banking	0.216	0.807
Agency banking does not Granger Cause mobile banking	0.841	0.442
Mobile banking does not Granger Cause agency banking	1.737	0.195
ATM banking does not Granger Cause mobile banking	2.220	0.128
Mobile banking does not Granger Cause ATM banking	2.661	0.088
Online banking does not Granger Cause mobile banking	0.218	0.806
Mobile banking does not Granger Cause online banking	0.023	0.977
ATM banking does not Granger Cause agency banking	0.418	0.663
Agency banking does not Granger Cause ATM banking	0.193	0.826
Online banking does not Granger Cause agency banking	0.718	0.497
Agency banking does not Granger Cause online banking	1.432	0.256
Online banking does not Granger Cause ATM banking	0.243	0.786
ATM banking does not Granger Cause online banking	2.272	0.122

There was no causality between mobile banking and financial deepening, agency banking and financial deepening, ATM banking and financial deepening and online banking and financial deepening. Further, none of banking innovations was casual with each other. These findings concurred with Mwai, Njeru and Memba (2019) who found that there was no causality between banking innovations and financial deepening of listed commercial banks in Kenya.

4.5.6 Hausman Test

Since the data was panel the appropriate model to fit was either random or fixed effects. Since the two models are mutually exclusive the choice between them was made through Hausman tests. The null hypothesis for this test stated that the appropriate model was random effects against an alternative that the appropriate model is fixed effects. Findings are shown in 4.8.

Table 4.8 Hausman Test

Test Summary		Chi-Sq. Statistic		Chi-Sq. d.f.	Prob.
		6.354		4	0.174
Variable	Fixed	Random	Var (Diff.)	Prob.	
Mobile banking	0.852	0.792	0.014	0.619	
Agency banking	0.752	0.596	0.013	0.176	
ATM banking	0.578	0.760	0.010	0.066	
Online banking	0.407	0.416	0.009	0.926	

The Chi square statistics was 6.354 and p value 0.174 which was greater than 0.05, thus there was no enough evidence to warrant rejection of the null hypothesis. Hence, we conclude that the most appropriate model to fit was random effects. These findings refuted Wanjau *et al.*, (2018) who fitted fixed effects model on examination of the influence of corporate transparency on financial performance of listed companies in East Africa Securities Exchanges. Further, the findings concurred with Mwai *et al.*, (2019) who evaluated moderating effect of banking size on the influence of banking innovations on financial deepening of listed commercial banks in Kenya.

4.6 Regression Analysis

Random Effect Regression model was adopted to evaluate the relationship between adoptions of financial innovations and tier one commercial banks financial deepening in Kenya. Study findings are in Table 4.9.

Table 4.9 Regression Analysis

Variable	Coefficient	Robust Std. Error	t-Statistic	Prob.
C	-31.882	6.861	-4.647	0.000
Mobile banking	0.792	0.263	3.009	0.000
Agency banking	0.596	0.221	2.698	0.000
ATM banking	0.760	0.363	2.092	0.000
Online banking	0.416	0.150	2.771	0.000
R-squared	0.579	Mean dependent variables		8.752
Adjusted R-squared	0.540	S.D. dependent variables		8.010
S.E. of regression	5.435	Sum squared residuals		1270.036
F-statistic	14.773	Durbin-Watson stat		2.024
Probability (F-statistic)	0.000			

The coefficient (β) values present the nature of the relationship between adoption of each financial innovation and financial deepening. Adoption of financial innovations are of the form mobile banking, agency banking, ATM banking and online banking in tier financial deepening levels. Multiple regression model is of the form:

$$\text{Financial Deepening} = -31.882 + 0.792\text{Mobile Banking} + 0.596\text{Agency Banking} + 0.760\text{ATM Banking} + 0.416\text{Online Banking}$$

There was significant influence of banking innovations on financial deepening of tier one commercial banks in Kenya, $F= 14.773$, $p\text{-value} = 0.00$ and less than 5% level of significance. This implies that at least of the slope coefficients was non-zero. An R squared

of 0.579, revealed that at least 57.9 percent of changes in financial deepening of commercial banks in Kenya can be accounted for by mobile banking, ATM banking, agency banking and online banking while the remaining percentage can be accounted for by other factors excluded in the model. The first hypothesis of the study stated that there was no significant effect of mobile banking on financial deepening of tier one commercial banks in Kenya. There was significant relationship between mobile banking and financial deepening of tier one commercial bank in Kenya. Further, this effect was positive, hence unit increase in mobile banking increased financial deepening by 0.792 units while holding agency banking, ATM banking and online banking constant ($\beta = 0.792$, $p \text{ value} = 0.00$ and less than 5% level of significance). These findings concurred with Ngii (2013), Kenyoru (2013) and Mwangi (2014) who documented positive and significant relationship between mobile banking and performance of commercial banks.

The second hypothesis of the study stated that there was no significant effect of agency banking on financial deepening of tier one commercial banks. Study findings indicates that agency banking had significant effect of financial deepening of tier one commercial banks in Kenya ($\beta = 0.596$, $p \text{ value} = 0.00$ and less than 5% level of significance). This effect was positive; thus, unit increase in agency banking increased financial deepening of commercial banks in Kenya by 0.596 units while holding mobile banking, ATM banking and online banking constant. These results concurred with Maina and Mwangi (2014), Ogetange (2014) and Munoru (2016) who documented positive and significant relationship between agency banking and performance of commercial banks.

The third hypothesis of the study stated that there was no significant effect of ATM banking and financial deepening of tier one commercial banks in Kenya. It was documented ATM banking has positive and significant effect of ATM banking on financial deepening of tier one commercial banks ($\beta = 0.760$, $p \text{ value} = 0.00$ and less than 5% level of significance). This implies that unit increase in ATM banking increases financial deepening by 0.760 units while holding mobile, agency and online banking constant. These findings concurred with Akhisar *et al.*, (2015) and Danlami and Mayowa (2014) who documented positive and significant influence of ATM banking on performance.

The fourth hypothesis of the study stated that there was no significant association between internet banking and financial deepening of tier one commercial banks in Kenya. Study findings indicates that internet banking has positive and significant relationship with financial deepening of tier one commercial banks in Kenya ($\beta = 0.416$, $p \text{ value} = 0.00$ and less than 5% level of significance). These results confirmed Ngungi (2013), Wanja (2014) and Nzioka (2014) who reported positive and significant relationship between internet banking and financial deepening.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents summary of major findings, conclusions and recommendations which are drawn from the major findings.

5.2 Summary of the Study

Banking sector has significant role in economic development. Despite of the pivotal role, the level of financial deepening is low hence banking innovations have been adopted to enhance access of financial services. Specific objectives of the study were to examine the effect of tier one mobile banking, agency banking, ATM banking and internet banking adoption on financial deepening. These objectives were drawn from empirical and theoretical underpinnings. The study adopted descriptive research design and census of 6 commercial banks for eight years from 2010. Random effects regression model examines the effect of tier one commercial banks innovations on financial deepening in Kenya.

5.2.1 Mobile Banking Adoption and Financial Deepening

The first objective sought to determine the effect of tier one mobile banking adoption on financial deepening in Kenya. Correlation analysis indicates strong positive and significant effect of tier one mobile banking adoption on financial deepening of commercial banks in Kenya. Regression analysis indicates positive and significant effect of tier one mobile banking adoption on financial deepening of commercial banks in Kenya. There was

significant relationship between mobile banking and financial deepening of tier one commercial bank in Kenya. Further, this effect was positive, hence unit increase in mobile banking increased financial deepening by 0.792 units while holding agency banking, ATM banking and online banking constant ($\beta = 0.792$, p value = 0.00 and less than 5% level of significance).

5.2.2 Agency Banking Adoption and Financial Deepening

The second objective aimed at establishing the impact of tier one agency banking adoption on financial deepening in Kenya. Correlation analysis indicates strongly positive impact of agency banking adoption on financial deepening of commercial banks in Kenya. Regression indicates positive and significant impact of adoption of agency banking on financial deepening of tier one commercial banks in Kenya. Study findings indicates that agency banking had significant effect of financial deepening of tier one commercial banks in Kenya ($\beta = 0.596$, p value = 0.00 and less than 5% level of significance).

5.2.3 ATM Banking Adoption and Financial Deepening

The third objective sought to assess the outcome of tier one ATM banking adoption on financial deepening in Kenya. Correlation indicates strong positive outcome of tier one ATM banking adoption on financial deepening in Kenya. Regression analysis findings indicates positive and significant outcome of tier one ATM banking adoption on financial deepening in Kenya. It was documented ATM banking has positive and significant effect of ATM banking on financial deepening of tier one commercial banks ($\beta = 0.760$, p value = 0.00 and less than 5% level of significance).

5.2.4 Internet Banking Adoption and Financial Deepening

The fourth objective of the study sought to determine the results of tier one internet banking adoption on financial deepening in Kenya. Correlation analysis results indicates strong and positive influence of tier one internet banking adoption on financial deepening in Kenya. Regression analysis findings indicates positive and significant influence of tier one internet banking adoption on financial deepening in Kenya. Study findings indicates that internet banking has positive and significant relationship with financial deepening of tier one commercial banks in Kenya ($\beta = 0.416$, $p \text{ value} = 0.00$ and less than 5% level of significance).

5.3 Conclusions

Based on the study findings several conclusions were made. For objective one, the study concluded that adoption of mobile banking has positive and significant effect on financial deepening. Consequently, there is need for commercial banks to integrate their banking operations with mobile phone.

The study found that agency banking has positive and significant effect on financial deepening. Hence, it can be concluded that there is need to take advantage of agency banking services especially to regions which has low mobile phone penetration and adopt agency banking services owing to proximity to banking agents. This would improve access to banking services especially in rural areas which has higher percentage of unbanked population.

ATM banking has positive and significant effect on financial deepening. Owing to desire for security while executing cash transactions, commercial banks should encourage their clients to adopt use of plastic money. Consequently, there is need to provide data security and enhance authorization procedure when using ATM banking services.

Internet banking had positive and significant effect on financial deepening of commercial banks in tier one in Kenya. Owing to positive reception and adoption of internet there is need for commercial banks to take advantage of it since it will minimize operational costs and optimize provision of banking services.

5.4 Recommendations

From the conclusions, the study made recommendation for policy, practice and further research.

5.4.1 Recommendations for Policy

Incorporation of mobile banking services would aid in achievement of government goals and objectives anchored on provision of banking services. Since the growth of mobile phone penetration may be inconsistent with commercial banks. Since there are operational costs associated with use of mobile phones there is need to evaluate cost benefit analysis associated with integration of banking services and mobile phones. Also, caution should be exercised since there are likelihood of loss of mobile phone or be coerced to withdraw cash.

Banking regulators such as Central Bank of Kenya and Capital Market Authority for listed tier one commercial banks should liberalize financial innovation. Such measures would aid in

penetration of banks and client access of banking services. Since banks have different services banking innovation should enhance access of all banking services.

5.4.2 Recommendations for Practice

To bank managers, since adoption of financial innovations has significant effect on financial deepening. This indicates that there is need for development and adoption of mobile banking, agency banking, ATM banking and internet banking that would minimize operational costs. This would enhance adoption of these financial products by customers. Owing to security issues associated with financial innovations there is need for multiple security authorization while accessing banking services via innovative approaches.

Use of agency banking has impacted positively on commercial banks services. There is need for commercial banks to regulate and control access of banking services. Commercial should continuously evaluate and authenticate documentations and receipts provided during provision of banking services by agents. Further, commercial banks should adopt market linking and market capabilities aimed at sensitizing potential clients of availability of banking services within their vicinity.

Use of credit and debit banks should be encouraged as an avenue to promote access to banking services. There is need for commercial banks to provide ATM access in alternative places such as shopping malls, petrol stations. This would encourage use of ATM banking services and discourage use of cash. Commercial banks should partner with savings and credit cooperative societies to aid in provision of ATM services.

There is need for support of internet banking services to encourage access to banking through non-traditional approaches. This would minimize operational costs of banks and would aid in promoting accessing of banking services. Further, there is need for adoption of data encryption and security measures to aid in protection of data pilferage owing to risk exposure which are associated with loss of data.

5.4.3 Recommendations for Further Research

From the current there is need for subsequent study to be carried out to examine the effect of savings and credit cooperative society' s innovations and financial deepening since there are key players in the financial sector. Secondly, there is need for a similar study to be carried out to examine the effect of financial deepening in tier two and three commercial banks in Kenya.

Also, banks can be classified into local and foreign, listed and non-listed and their effect of banking innovations and financial deepening. Further, there is need to examine moderating effect of attributes such as bank size, income diversification on the effect of banking innovation on financial performance. Also, there is need to explore the effect of banking innovations on income diversification of commercial banks in Kenya. Future scholars should examine the effect of banking innovations on financial stability of commercial banks in Kenya.

5.5 Limitations of the Study

The study was limited to tier one banks; hence these findings may not be generalized among other banks which are operating in Kenya. The study gathered data for only six banks and eight years. There is need for extension of the period beyond eight years to not only increase the sample size but also evaluate long run effect of financial innovation adoption on financial deepening of commercial banks in Kenya. The study fitted regression model with robust standard errors there is need for adoption of FGLS.

5.6 Contribution of the Study

The study contributed empirically since it aided in breaking the stalemate on ambivalent findings on the effect of financial innovation on banking performance. Through, it tier one commercial banks in Kenya are positively and significantly affected by financial innovations. The study made methodological contribution since it examined the effect of financial innovation through use of panel data. Prior to modeling the study proved the role of diagnostic tests in making non-biased decisions. The study made theoretical contribution since the findings supported innovation diffusion theory. Thus, there is need for commercial banks to disrupt their operations through adoption of innovative approaches in their operations.

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APPENDICES

Appendix I Introduction Letter

Emily Winga,

P.O. Box 73212-0020

Nairobi.

RE: REQUEST FOR RESEARCH DATA

I am a Master of Business Administration in Finance Student in Kenyatta University. You have been randomly selected for the study on “ **Adoption of Financial Innovations by Tier One Commercial Banks and Financial Deepening in Kenya**”. This check index has four sections. Please fill the check index as honesty as possible since this information will not be used for any other purpose apart from academic research. For purpose of confidentiality please do not indicate your name. The check index is anonymous, and no individual person will be identified or connected with a particular set of information or research findings. Your cooperation in completing this check index is greatly appreciated.

Emily Winga,

MBA. Student

Appendix II Research Instrument (Disclosure Check List)


Variables	Measure	2010	2011	2012	2013	2014	2015	2016	2017	2018
Independent Variables										
Mobile banking (X ₁)	---Mobile banking transaction volume									
Agency banking (X ₂)	--Volume of transactions through agency banking									
ATM banking (X ₃)	--volume of transaction handled by ATMs									
Internet banking (X ₄)	----Deposit mobilized via internet transactions									
Dependent variable										
Financial Deepening (Y)	Proportionate change in banking services access									


Appendix III List of Commercial Banks in Kenya

Bank code	Name	Tier
1	Kenya Commercial Bank	1
2	Standard Chartered Bank Kenya Limited	1
3	Barclays Bank of Kenya Limited	1
7	NCBA	1
11	Co-operative Bank of Kenya Limited	1
68	Equity Bank Limited	1
12	National Bank of Kenya Limited	2
16	Citibank N A	2
19	Bank of Africa Kenya Limited	2
31	Stanbic Bank Kenya Limited	2
43	ECO Bank Limited	2
57	I&M Bank Limited	2
61	Housing Finance Bank	2
63	Diamond Trust Bank Limited	2
70	Family Bank Ltd	2
5	Bank of India	3
6	Bank of Baroda (Kenya Limited)	3
8	Habib Bank Limited	3
10	Prime Bank Limited	3
14	M-Oriental Bank Limited	3
17	Habib Bank A G Zurich	3
18	Middle East Bank Kenya Limited	3
23	Consolidated Bank of Kenya Limited	3
25	Credit Bank Limited	3
26	Access Bank of Kenya	3
35	African Banking Corp. Bank Ltd	3
49	Spire Bank Ltd	3
50	Paramount Universal Bank Limited	3
51	Kingdom Bank	3
53	Guaranty Trust Bank (Kenya) Ltd.	3
54	Victoria Commercial Bank Limited	3
55	Guardian Bank Limited	3
59	Development Bank of Kenya Limited	3
66	Sidian Bank Limited	3
72	Gulf African Bank Ltd	3
74	First Community Bank	3
76	UBA Kenya Bank Ltd	3

(CBK, 2020)


Appendix IV NACOSTI Research Permit


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RESEARCH LICENSE




**This is to Certify that Ms.. Emily Winga of Kenyatta University, has been licensed to conduct research in Nairobi on the topic:
INNOVATIONS BY TIER ONE COMMERCIAL BANKS AND FINANCIAL DEEPENING IN KENYA for the period ending :
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