

**EFFECT OF FINANCIAL INNOVATION ON THE PROFITABILITY OF
PUBLIC COMMERCIAL BANKS IN KENYA**

BY

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DECLARATION

This research project is my original work and has not been submitted for the award of a degree in any other University.

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DEDICATION

To my entire loving Family: your prayers, love and encouragement all along my study period were my greatest pillars of strength and reason to finish the journey.

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ABBREVIATIONS

ATM	Automated Teller Machine
CB	Consolidated Bank
CBK	Central Bank of Kenya
DBK	Development Bank of Kenya
EFT	Electronic Funds Transfer
ICT	Information and Communication Technology
NBK	National Bank of Kenya
NPLs	Non-Performing Loans
PST	Point of Sale Terminal
PSU	Public Sector Undertakings
ROA	Return on Assets
ROE	Return on Equity
RTGS	Real Time Gross Settlement
SMS	Short Messaging Service
SPSS	Statistical Package for Social Sciences
SSA	Sub Saharan Africa
US	United States

ABSTRACT

The study was aimed at assessing the effect of financial innovation on the profitability of public commercial banks in Kenya as key contributors to the economy, covering a 12-year period. The Kenyan financial sector has experienced fast-paced financial innovations accelerated by technological advancements. However, the contribution of such efficient financial systems towards bank profitability is not always positive due to some cases of reverse causality between financial innovation and profitability. The research study employed a causal research design, with the population of study being the entire 3 public commercial in Kenya as at 30th June 2018. Sampling was not applied due to the small population size. Secondary data was obtained from CBK's published annual reports. Dependent variable was consolidated profitability while the independent variable was consolidated financial innovations within the banks. Study results revealed that some financial innovations positively impact on the profitability of public commercial banks in Kenya. There is a positive correlation between profitability of public commercial banks and Automatic Teller Machines and Real Time Gross Settlements. However Mobile banking is negatively correlated to bank profitability. Some financial innovations are adopted by the banks for reasons of customer retention due to the efficiency and cost saving they provide to customers, not necessarily for bank profitability purposes. This is explained by the increasing provision of mobile banking services despite the negative effect on bank profitability. Mobile banking comes with less bank income as compared with traditional payment systems. Over time, the use of mobile banking has steadily increased, reducing and replacing the less efficient legacy financial systems; ATMs and RTGS as evidenced by the negative correlation between ATM / RTGS transactions and Mobile Banking. Development and implementation of even more efficient financial payment systems should be advocated for, but with the necessary regulatory frameworks in place. This will accelerate improved profitability, general financial performance in the banks hence contribute to increased economic growth.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The global banking system is in a transformation caused by increasing market integration and deregulation. Financial innovations anchored on technology that include ATMs, mobile phone banking and other smartcard platforms are coming up at a high speed in the world banking industry. Banking activities started around the year 1694 when the bank of England opened its doors (Wachira, 2013). Today, financial innovation is one of the top ingredients in building a bank's competitive edge in achieving high financial performance in a highly competitive market.

Financial innovation has been employed by banks as a strategic way of positioning themselves against competitive forces amongst other banks, while accelerating their financial health and achieving operational effectiveness in the banking industry. This has been done with the application of information and communication technology (ICT) to enhance product innovativeness. Information and Communication Technology (ICT) refers to technologies used by firms, organization, individuals or groups of people to collect, store and share the information via computer networks (Nkem & Akujinma, 2017). Financial innovation involves the development of new financial products or financial services, change of processes or operations, creation of new institutions,

embracing new technologies and birthing new ideas that have a new impact in financial markets. As a result, the study of financial innovations has been necessitated by the need for firms to keep abreast with the newness in the financial markets.

The banking sector in Kenya has faced major technological developments in the last twenty years. Numerous changes have happened within the industry resulting to multiplication of financial products and services hence improving the operational experiences of the financial markets. Technological and economic developments have pushed the need for such changes. Such developments coupled alongside others in the global financial environment and the making of an integrated market place have resulted to fast-paced financial innovation. The modern financial system has grown tremendously in its importance coupling with the increasing rate of financial innovation to create a thirst for research in financial innovation (Muiruri & Ngari, 2014).

This study is aimed at assessing the effect of financial innovation on the profitability of public commercial banks in Kenya, which face stiff competition from their privately owned counterparts in attracting and retaining a stronger customer base. The greatest driving force behind this is the growing rate at which the private banks are utilizing financial innovation strategies, especially anchored on technology to enhance their overall performance through increased profitability. Thus the need for public commercial banks to lay emphasis on their innovativeness in offering financial services. This study will be guided by four theories of financial innovation which include transactions cost innovation theory by Hicks & Niehans (1983), constraint induced innovation theory by

Silber (1983), regulation innovation theory by Scylla (1982) and circumvention innovation theory by Kane (1987).

1.1.1 Financial Innovation

Financial innovation can be defined as the process of creating and popularizing new financial products and services, new financial technologies and financial systems. These innovations could be categorized into product or process innovation. Product innovations include new derivatives, new bonds or new forms of investment products, while process innovations include new methods or ways of allocating securities, transaction processing and pricing methods (Tufano, 2002). Frame & White (2002) defined financial innovation as a new thing which brings risks down, reducing operational costs or creating improvement on products and services that attract a bigger market share for the firm. They also noted that financial innovations could be a response to technological changes, growing firm risk exposure or even to new regulations in the sector.

Some of the common examples of financial innovation in the banking sector include Mobile phone banking, internet / online banking, agency banking, use of RTGS services and the use of Automated Teller Machines (ATMs). These innovative products are built on information and communication technologies. Ignazio (2007) also classified financial innovations as new products (mortgages), new services (internet banking), new organizational forms or new production processes (credit scoring).

Lerner (2002) found that financial innovations are vital for companies in the financial services sector just as they are for those in the non-financial sectors. This is because they provide a model for generating capital with higher cost efficiency. As demonstrated by Beaver (2002), financial innovation is a must condition of economic growth for nations as well as competitive strategies for entities in any industry.

1.1.2 Bank Profitability

In accounting, a profit is defined as a financial benefit that is realized when the amount of revenue generated from operations exceed expenses and other costs incurred in the running of the business. It quantifies success of business and the means of its survival and growth. Therefore profitability is a means to determine the ability of a firm to make profit for its investors. Profitability is a measure of efficiency and effectiveness of any business operations undertaken by an entity (Narjess, 2005). A business that is not profitable cannot thrive. On the other hand, a business that has high profitability is able to reward the investors with huge return for investments made. Improving firm profitability is a key function entrusted to the entity management; they should always seek to improve the business and hence enhance returns (Singh, 2015).

Profitability is not only praised as the most crucial indicator of financial performance, but it is also the salient feature and a significant item of exploration for any experienced business entity (Tariq et al., 2014). Performance measurement is now everywhere in the global banking industry. It is performed to provide investors in the banking sector with accurate information concerning how their investments are being utilized to generate

returns. Commercial banks are the major sources of credit in any economy, credit that is employed in the production processes to drive the economy. The efficiency of commercial banking activities does affect the entire economy of a country (Kiptum, 2016).

Profitability of a firm is mostly determined by the calculation of accounting ratios. Rate of return on assets (ROA) and the rate of return on equity (ROE) are the common ones. ROA measures the amount of profit earned per shilling of assets employed. This is a reflection of the efficiency with which the bank's managers use banks invested assets to generate income. ROE on the other hand connotes the rate of return on owner's equity invested in the entity. As put by Bentum (2012), ROA connotes management efficiency and the effectiveness and efficiency levels at which the bank management operates as they use the organization's assets. A high ROA or high ROE is an indication of a financially healthy firm and the reverse is also true.

1.1.3 Financial Innovation and Bank Profitability

Several theories of financial innovation have been founded over a substantial period of time now. Schumpeterian school of thought argues that new products, services and processes resulting from financial innovations are initially not imitated by competitors for a certain period of time. Therefore the innovation creates a proprietary competitive edge to the company or the innovator and thus better financial performance (Lyons, Chatman & Joyce, 2007). Out of the Schumpeterian process, imitations begin to happen destroying the creativity of the innovation. This pushes for the need to innovate further and

differently a competitive status. Mansury & Love (2008) contend that customer care systems as well as bank operation technologies are some of the core banking areas that have had significant influence on bank performance results.

The developments that have been witnessed in the world banking sector in terms of information and communication solutions have produced far reaching benefits after a heavy usage of information technology. Such usage has been as a reliable measure of success for the banking institutions (Sujud & Boutheina, 2017). The adoption of financial innovation could result into higher financial performance, through bigger market command, widened product variations, unique products and higher address of customer demands work together to increase profitability (Muia, 2013). As argued by Zacchaeus (2017), the driving force behind such high effect of financial innovations on banking are the high adoption rates and improved market efficiency in the banking sector. These innovations have provided wider and varied set of financial services accessible to customers in the past decades, financial system efficiency thus contributing to a more advanced banking industry.

1.1.4 Public Commercial Banks in Kenya

Public commercial banks in Kenya are classified as those that the Kenya government has a majority shareholding through government agencies. According to CBK annual Report (2016), they are three; National Bank of Kenya, Development Bank of Kenya and Consolidated Bank of Kenya. They are regulated by the Banking Act, Companies Act, the Central Bank of Kenya Act and other guidelines issued by the CBK. The CBK, which

falls under the Ministry of Finance, does monetary policy formulations and for effective monetary and financial system control (CBK, 2011).

Kenyan public commercial banks have developed various financial innovations anchored on technology. National bank of Kenya (NBK) has adopted Virtual Distribution Network financial innovations including NatMobile, NatConnect, Diaspora Banking and Smart Card banking (NBK Newsletter, 3rd Ed.). Consolidated Bank (CB) on the other hand has over the years ventured into E-banking, M- banking and agency banking services (CB website, 2018). The development bank of Kenya (DBK) has not been left out in financial innovations; it has embraced Real Time Gross Transfer (RTGS) and Electronic Funds Transfer (EFT) as its innovation products (CB website, 2018).

Financial performance of public commercial banks regarding profitability since the inception of financial innovations, indicates an upward growth save for the recent economic turmoil in the periods between years 2016 and 2017 when the banking industry in Kenya went through tough times occasioned by interest rate capping and general elections related depression. As echoed by NBK chairman (2016), the bank registered an improved performance in 2016, despite what was a very competitive and turbulent environment in the banking industry as a whole. It recorded a profit before tax of KES182 million for the period ended December 31, 2016. This denotes a significant improvement in profitability, compared to the KES1.6 billion loss position registered the previous year.

1.2 Research Problem

The financial services sector has undergone massive changes due to changing market trends occasioned by changes in financial products and services, changes in customer needs and demands and technological advancements that have made the financial system more efficient and widely varied. To maintain a competitive position, banking institutions have been forced to ensure they provide new products and services, expanding the existing ones, and adding new delivery channels. Banks have had to win more customers by having superior products and making them easily accessible through technology based distributions which include online banking and EFT (CBK, 2016).

Information specifying the impact of financial innovation within developing economies like Kenya is little since most of the available literature is focused on the advanced economies of the world. Financial innovation has been indicated to affect economic growth and development of the overall economy as it directly improves financial performance of commercial banks in Kenya (CBK, 2011). The acceleration in such innovation within the banking system as well as the growing value of the sector in elite economies has created a research interest in financial innovation and the resulting impact on financial performance of commercial banks in Kenya.

A number of scholars have conducted research covering financial innovation with regard to bank profitability. Sujud & Hashem (2017) looked at financial innovations specifically the use of mobile phone banking, automated teller machines (ATM), online banking smart cards and electronic funds transfer (EFT). They investigated innovations in relation

to bank profitability; return on assets (ROA) of commercial banks in Lebanon. The results revealed that there was significant positive impact of financial innovations on the profitability of Lebanese commercial banks. Mabrouk & Mamoghli (2010) studied the dynamics of financial innovation and financial performance of banks in an emerging banking industry. They analyzed the significance of product innovation (mobile banking) and process innovation (ATMs and EFT) on the performance of those banks. They also analyzed adoption behaviors of first movers and imitators. The study found that the first movers in product adoption experienced improvements in profitability while process first movers had a positive contribution towards bank profitability and operational efficiency.

Local studies have assessed the effect of banking sector financial innovations on the profitability of commercial banks in Kenya. A recent study was conducted by Kariu (2017) to establish effect of financial innovation on commercial banks profitability in Kenya and found that financial innovations positively impacted financial performance hence profitability and recommended that banks' management should enter into more partnerships with mobile phone service providers to increase customer use of the platform for banking transactions hence increasing financial performance. Gakure & Ngumi (2013) did a study on whether bank innovations influence profitability of commercial banks in Kenya. He noted that bank innovations had significant influence on the profits of commercial banks in Kenya. Another study by Ngigi (2012) sought to establish what effect financial innovation had on the financial performance of commercial banks in Kenya. Results indicated that financial innovation significantly contributes to profitability in the banking sector and especially within commercial banks.

Aduda & Kingoo (2012) investigated the connection between electronic banking and performance of commercial banks, financially, in Kenya. He concluded that there existed a positive relationship between electronic banking and bank performance.

However, existing literature has some identified research gaps. In Kenya, more attention is paid to the private sector probably because of the profit driven motives whilst less focus is given to the public sector which ought to offer public goods and services. For this reason, this study seeks to bridge this attention deprivation gap by carrying out a research on banking specific to the public commercial banks. The few available studies which are focused on commercial banks in general; none of the studies ever focused on the public commercial banks in isolation as a key subsector, as classified by the Central Bank of Kenya financial reporting guidelines. Public commercial banks, which are considered as government business undertakings play a vital function in the financial system and the economy as a whole. Also, nearly all the studies are on general financial performance of banks. There are scanty studies focusing on bank profitability as an indicator of banks' financial performance level. Thus this research study is seeking to address these identified gaps. This study will therefore answer the question, what is the effect of financial innovation on the profitability of public commercial banks in Kenya.

1.3 Objective of the Study

To find out the effect of financial innovation on the profitability of public commercial banks in Kenya.

1.4 Value of the Study

The results of this study will provide a solid basis on which the government of Kenya which owns the banks under this study can formulate policy and regulations that are well informed, balanced and laying a supportive background of financial innovation initiatives by the financial market players. The policies therefrom will be able to enhance global competitiveness of the country, domestic economic and structural growth thus achieving national goals.

The study findings will assist bank managers in assessing the effect of financial innovation on the day to day running of the institutions, which result into increased profitability, hence better financial performance. Bank management will be guided to make deliberate efforts to leverage their operations on modern technological innovations in an effort to maximize stakeholders' wealth and interests. Further, the management of the public commercial banks will be able to steer competitiveness through effective financial innovations against privately owned banks that pose great market threat to their survival in the market.

As for scholarly use, the study will add to the available knowledge base by recommending improvements on profitability of public banks by leveraging on technological financial innovations. It will provide additional literature which will be of great use to students and other scholars or researchers. It will also form a justification for further research work to develop the subject matter in better ways.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section analyses the various works of research that have preceded this study on financial innovation and bank profitability in relation to the research problem. It compiles available knowledge in summary obtained from the research findings of other researchers work on similar areas of technological innovation and its influence on bank profitability.

2.2 Theoretical Literature Review

There exist various theories that seek to explain the effect of financial innovations of bank profitability. This study will consider four theories in establishing its theoretical framework. These include transaction cost innovation theory, constraint-induced theory, circumvention innovation theory and regulation innovation theory.

2.2.1 Transaction Cost Innovation Theory

Transaction cost theory was put forth by Hicks & Niehans (1983). According to their findings, the main aim of financial innovation was to reduce costs of executing transactions in any strategic business activities. Financial innovation is believed to have been a result of advancement in technology which sought to reduce transaction costs. That reduced transaction stimulates financial innovation and hence improved financial services. Their study was based on microscopic economic structural changes. This theory supports the belief that the key goal of financial innovation lies at reducing transaction costs. From a different note, the theory proposed a varied view of the underlying goal

behind financial innovation as to result into an organization's increased benefits or profitability.

The use of ICT in business processes can contribute to substantial reduction in the cost of executing transactions due to the efficiency brought about by these information and communication technologies that are internet- driven. Internet and mobile phone enabled access provide remote accessibility of the entity's information databases as well as other useful data thus facilitating more cost reduction. The modern day banking that is enabled via mobile phone banking, online banking, automated teller machines and electronic funds transfers, all reduce the overall operational costs incurred by the banks and therefore resulting into improved bank profitability.

2.2.2 Constraint- Induced Innovation Theory

Silber (1983) came up with the constraint induced innovation theory. He argued that the reason for maximizing profits or gains by financial services companies was the force behind innovation. The presence of both internal and external constraints or limiting factors such as policies, statutory regulations, organizational structures and management are inevitable in the strive for profit maximization. Despite the importance of these limitations for healthy firm management, they may derail operational efficiency hence the need to innovate against or around them.

In his other arguments, Silber (1983) articulated discussed the constraint-based idea of innovation. He suggested that the small companies who face the most restrictions would

be the most likely to engage in innovative activities in a bid to shield themselves against the adversities of internal and external constraints. Although this claim is evident in the real world of financial services sector, it lacks the backing of solid empirical evidence. There however contrary arguments (Tufano, 1989) for securities innovations. He suggested that the bigger and more financially stable banking institutions have been leading in financial innovations.

This theory will aid in identifying factors or constraints in the Kenyan financial system that have necessitated financial innovations by the banking institutions for market survival and the overall value of effect on their performance in terms of profitability.

2.2.3 Regulation Innovation Theory

This theory was proposed by Scylla (1982). He discusses financial innovation based history of economic development. He believed that financial innovation is easily connectable to social controls, which in turn had double faced effect and causality to the economy and mutual causality with economic regulation. It is impossible to have financial innovation in a fully restricted and controlled economy as well as in the perfect market system. New developments within regulation of a banking financial system are in themselves financial innovations. Government controlled economies are the only ones capable of undertaking successful financial innovations. Financial system hindrances resulting from government interventions will result in numerous forms of financial innovations focused to avoid or circumvent such restrictions. This finally forms the cycles of financial development called control-innovate and control again-innovate again.

Regulation usually manifests in two faces. On the one hand, controls and regulations end up suffocating financial innovation efforts due to the activity restrictions imposed by the regulations. For instance, regulations that restrict regional expansion of banking institutions deny them the benefits that are born out of branching innovations. While on the other hand, financial innovation can be caused by strategies meant to circumvent regulations. Thus it is difficult to concisely declare positive or negative relationship between the level of regulation and financial innovativeness. It all depends on if the regulation is viewed with social worthiness as a social waste (Frame & White, 2002).

Kane, (1982) observed that regulation and innovation cause the other. Regulation often results in the need for innovation to evade it while on the other hand, innovation may necessitate formation of new or adjusted regulations to control it. Firms find that some regulations inhibit their profit making efforts thus engage in "loophole mining" tricks to avoid regulations.

Public commercial banks in Kenya operate under CBK regulations and other controls enforced by several regulatory bodies thus any financial innovations by these banks have to adhere to set regulations.

2.2.4 Circumvention Innovation Theory

This theory was put forth by Kane (1987). He outlined the various forms of government interventions in the financial system. He was of the thought that at most times, government controls or regulations have the same effect as taxation; eating into the

profits of a firm and essentially the very profit making avenues. Therefore market innovation and regulation innovation are the retaliatory efforts to survive in the economy. The uniqueness of the financial sector attracts more stringent controls than any other in the market. The institutions affected thus find ways to mitigate probable loss of profits caused by government regulations. Kane's assumption of regulation innovation was that which cements the regulation but the real picture is that which sets the financial markets free of restrictions.

It is also thought that a free or a liberal financial system is proportional to financial innovation that results. Withdrawal of stringent regulations facilitates financial institutions to expand into new markets and offer more services with more innovation. Consequently these financial innovations leave the government with no choice other than reduce or remove the regulations from the financial market. With a more liberal financial system, the market players are faced with new challenges and risks such as interest rates and political interferences which require financial innovations to tackle them (Harrington, 1992). Public commercial banks in Kenya are faced by an overly ambitious tax regime thus they have to put up strategies to reduce their tax burdens that eat into their profitability thus resulting into circumventive financial innovations. This theory will therefore be guiding this study.

2.3 Determinants of Public Commercial Banks' Profitability

Bank size determines the level economies of scale that the bank benefits from. Banks' real assets determine bank size. Increase in bank size translates into more market power

and hence growth in profits. The profitability of a bank largely depends on the growing bank size with regards to total assets (Smirlock, 1985). Smirlocks explains that the level of profitability between small and big is because of the level of technologies used in the process of production and output that determine the saving made by economies of scale. Although some scholars are of the contrary opinion that the cost saving made from increasing the size of the bank is not significant (Berger et. al 1987).

Efficiency and productivity that a bank achieves in its banking operations. Efficiency is achieved through cost management to ensure that revenues are in excess of expenses thus increasing profitability. Whereas increase in labour productivity increases bank profitability (Athanasoglou et al 2005). Labour productivity is achieved through appropriately skilled labour force, quality training, lean number of staff, lowering staff turnover and keeping them motivated. The high output from efficiency and productivity should be applied to profitable ventures for overall growth in the profitability of the banking firm.

Banks' level of credit risk arising from the probability that it will incur financial losses due to defaulted credit advances. Credit risk is a percentage of non-performing loans (NPLs) to total loans issued. Determination of a bank's level of credit risk is paramount for any forward looking bank management for planning purposes. Such planning would bank pricing differentiation pegged to risk profiles of each product. The higher the credit risk, the higher the profits and vice versa connoting a positive relationship between credit risk and bank profitability. Al-Hashimi (2007) investigated the influence of bank credit

risk in Africa on interest, and found that it was positive. Therefore this yields to an increase in the cost incurred in generating a unit worth of income which in the end negatively affect profitability.

Market power acquired by banks through the size of market share that they command. A bank with a higher market power has more influence thus commanding a bigger and stronger customer base. It taps into high value operations, sales and revenue that translate into increased profitability. Management efficiency is a must since the higher the activities the tendency for the costs to increase especially so in developing economies like Africa (Goddard, Molyneux & Wilson, 2004). Operational costs should be well managed through pricing strategies that pass on some of the costs to banking customers.

Bank Ownership is another factor that has been evidenced to affect bank performance. Privately owned banks depict a superior performance level as compared to publicly owned banks which are not necessarily geared towards profit making as the main objective. In developing countries like Kenya, foreign owned may enjoy superior technologies Vis a Vis local banks hence operational efficiency disparities. Clarke et al (2000) found that local or domestic banks were less profitable than foreign banks in 3rd world economies because of taxation policies and other incentives granted to domestic or foreign firms as the case may apply.

2.4 Empirical Literature Review

Agboola (2006) carried out an investigation in Nigeria concerning the use of ICT in banking activities. He specifically looked at the type of innovation technologies used, the degree to which they were applied and the effect of those innovations on the banks' operations. He concluded that innovative technology was the biggest stimulator to building competitive edge of banks. He sampled half of the banking institutions in the year 2005. Some of the financial innovations he encountered in his study ranged from the application of ATMs, EFT, telephone banking, electronic banking and smart cards. He believes that using IT services in banking helps a bank acquire a good reputation within the industry thus attracting a bigger market share. It is therefore, according to him, important that banks invest in innovative technologies so as to remain competitive in providing faster and convenient banking services that customers enjoy.

Shirley & Sushanta (2006) assessed the influence of information technology on banking operations. They ascertained the contribution of information technology on banking profitability. They identified various innovation services or products that included online banking, EFTs and securities. They tested a sample of 22 banks in the USA covering 20 years to establish what effect IT had on banking profitability. The results of their study however had negative implications since they found that despite the use of cost effective technologies that lower bank operation costs, heavy investment in IT infrastructure resulted in networking that reduced bank profitability. They also found that the degree of relation of IT investments with banking profits was dependent on the degree of the

network effect created; if it is small, IT investment reduce human capital costs, attract a larger market share increasing revenue and higher profitability.

Mabrouk & Mamoghli (2010) studied an emerging market of the banking sector. They looked at what effect product and process innovations had on the financial performance of banks. Their variables included SMS and telephone banking, ATMs, Electronic payments, debit and credit cards. Their analysis focused on innovation adoption behaviors, first movers and imitators. They established that first movers enjoyed higher banking profitability from product innovation and operational efficiency from process innovation. Whereas banks that imitated were of lesser profitability and efficiency as compared to first movers.

DeYoung (2005) assessed performance of internet only banks in comparison to the “analogue” banks in USA. He discovered that numerous internet only banking experiences with all startup businesses. However that did not necessarily link internet banking to any concrete evidence that it grows the profitability of banks. His study findings indicated that in the US, the profitability of internet only banks was lower than the conventional operations banks. From another review, DeYoung, et al., (2007) engaged USA community banking in establishing what impact internet banking had on bank performance. The analysis of conventional banking that had transactional websites for a three year period on bank performance was conducted. They found that internet banking enhanced bank profitability due to the growth in revenue generated by internet service charges of money transfers, online deposits and investments.

Tufano (1989) studied financial innovation and first mover advantages. His main goal was to establish if financial innovators benefit from first mover advantages. He sampled 58 financial innovations from 1,944 publicly traded securities over a period of 13 years. He investigated if investment banks that issue new securities enjoy higher issue prices or securing a larger market as compared to imitators. He found that first movers that create new products actually charged normal prices before imitators introduced their products and ended up charging lower than imitators due to competition. However first mover innovators underwrote more public offerings on their innovations than their imitators. Tufano's findings strongly suggested that it was cost advantages and not pricing advantages that the first mover investment banks enjoyed in attracting a bigger market share.

Kariu (2017) conducted a study on whether financial innovation affected financial performance of commercial banks in Kenya. She studied mobile phone services usage to execute banking transactions amongst the Kenyan population. Her findings point that financial innovations positively influenced financial performance of banks and recommended that banks' management should enter into more partnerships with mobile phone service providers to increase customer use of the platform for banking transactions hence increasing financial performance of the banks.

Zacchaeus (2017) contend that financial innovations have a remarkable impact on the financial system growth and development that creates market efficiency. He found that

the main factor behind the high influence bank innovations had on bank performance was high rates in adoptions by the financial sector players and presence of efficient markets. Rapid innovations highly factored in the past as a game changer in the provision of banking serviced to users and increased efficiency of financial system and are becoming a key factor in development of banking sector and increased banks' financial performance.

Gakure and Ngumi (2013) researched on what influence bank innovations had on profitability of commercial banks in Kenya. This study was conducted in 2012. Findings established that bank innovations did have great impact on banks' revenues, ROA, profit making and amount of deposits by customers. They also found that the use of mobile phones in banking had a bigger influence than online banking in terms of their contribution to overall financial performance of commercial banks in Kenya. They concluded on a positive note that bank innovations enhance financial performance of bank in Kenya. They recommended implementation of business partnerships between mobile phone and internet service providers and the commercial banks. The government of Kenya should be involved in these partnerships to enable a sustainable business environment for innovation development and the economy at large.

Nyangosi and Arora (2011) studied the use of electronic banking by financial institutions in Kenya. They found adoption of electronic delivery channels by banks to enhance service access by users. They focused on mobile phone banking and internet banking to assess their effect on banking activities. They noted that the use of ATMs and SMS

banking were the most widely used channels. Customers engaged the website via internet to identify bank products and to access other general personal bank account information thus internet banking was growing in its usage. Initially, internet banking was meant for information services only but with time and development of internet security, internet banking is becoming more transactional and popular. Customers can now execute most of their day to day banking activities on internet banking such as money transfers and utility bill payments.

Kamotho (2009) carried out a study on mobile phone banking focusing on usage experiences in Kenya among the end users. The study focused on Safaricom and Zain for a period of three years. Customer experiences were quantified through a quantitative survey on M-Banking services. The study found that financial innovation is pushed by competitive pressure in the market. Innovation is thus a response to high demands for market power and share thus resulting into the creation of new products and better services, delivering them through efficient channels of distribution. The result also includes lower operational costs for the banks and transactional costs for the customers. Separate findings by (Tufano, 1989) also support this study conclusion. Unlike a common belief that mobile phone banking is used for money transfers, he notes that from 96% of the respondents, it is used as a means to hold or store funds.

King'ori (2008) studied partnerships among mobile phone operators and banking institutions in Kenya. He sought to assess the role of this partnership on level of financial access amongst users. He found that the use of mobile phones reduced and in some cases

eliminated complex requirements to account opening such as tedious paper work, interest free transactions, maintenance free bank accounts and mobile application for emergency funds. This finding was supported by his other study on the factors that influence money velocity in Kenya. He found that innovations were greatly driving the Kenyan financial system and that as a result, customer access to banking products and services had increased and transformed over time. The effect was felt by both the customers who bought more from the banks and the commercial banks as well in form of improved bank profitability.

2.5 Conceptual Framework

A conceptual framework is a depiction of a relationship between variables that are being studied or investigated. This study seeks to establish what effect financial innovation has on the profitability of public commercial banks in Kenya. Independent variables include ATMs (measured by number of ATM transactions), mobile banking (measured by number of mobile phone banking), RTGS (measured by number of RTGS transactions), bank's size (measured by monetary value of total assets), and credit risk (measured by ratio of non-performing loans to total loans). Dependent variable will be bank profitability (measurable using return on assets, $ROA = \text{Profit before Tax} / \text{Total assets}$).

Independent variables

Dependent variable

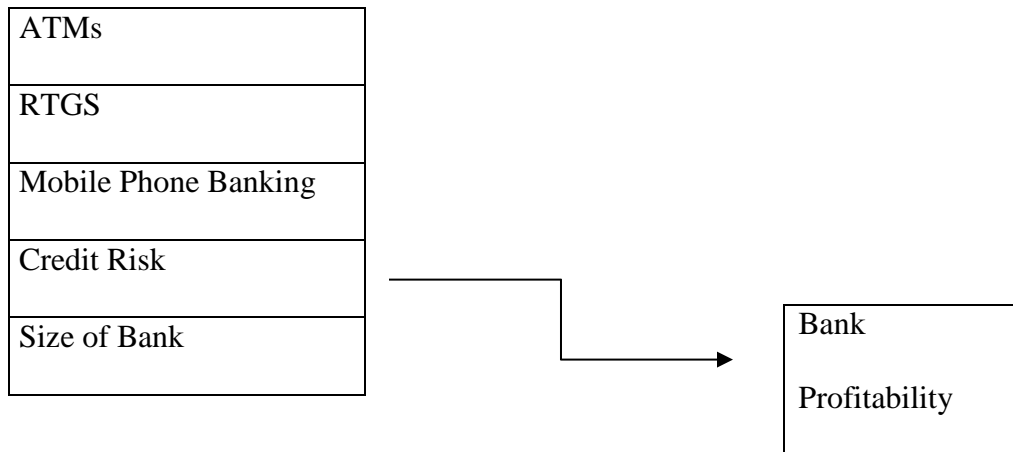


Figure 2.1 Conceptual Framework

2.6 Summary of Literature Review

Financial innovation has been studied and researched extensively the world over in the last three decades. Thus the availability of literary material on this matter has increased substantially. Numerous theories of financial innovation seeking to explain it and its impact on the financial system have been documented as well. Advancements in ICT and other financial technologies have enabled banking related innovations that have seen many Kenyans easily and cheaply access banking services. The literature contained herein strived to emphasize four theories of financial innovation namely, transactions cost innovation theory by Hicks and Niehans (1983), constraint induced innovation theory by Silber (1983), regulation innovation theory by Scylla (1982) and circumvention innovation theory by Kane (1987).

From the foregoing applicable literature material, it is true that studies in this area of financial innovation have been done although not based on a more specific manner. In Kenya, more attention is paid to the private sector probably because of the profit driven motives whilst less focus is given to the public sector which ought to offer public goods and services. For this reason, this study seeks to bridge this attention deprivation gap by carrying out a research on banking specific to the public commercial banks. A review of several empirical studies showed a lack of focus on the influence of financial innovation on the profitability of public commercial banks in Kenya. Nearly all studies dealt with financial innovation and profitability of Kenyan commercial banks in general. According to Commercial Banks classification by CBK financial reporting guidelines, public commercial banks which are considered as government business undertakings play a vital function in the financial system and the economy as a whole. Still, only a few studies have focused on bank profitability as key aspect of measuring bank financial performance. This study will thus endeavor to address these information gaps.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This section spells out the methods and steps that were used for collection, presenting and analyzing data relevant to realization of the research objective. It details among others, research design, population, sampling technique and sizes, data collection and instruments as well as data analysis.

3.2 Research Design

According to Cooper and Schindler (2006), a causal study is used for assessing the influence of a variable or a group of variables on another variable (s) representing a causation behavior. Causal Research establishes the effect of one thing on another; the effect of one variable on another. This research sought to establish the effect of financial innovation on public commercial banks' profitability in Kenya using a causality design.

The study employed quantitative data from published financial data from the Central Bank of Kenya. The quantitative data was used to fully bring out the characteristics of the study variables that would enable the researcher make sound conclusions.

3.3 Sample Size and Population

Cooper and Schindler (2001) termed population as total collection of elements around which the researcher makes his/her inference from. Selected population of study was the

3 public commercial banks in Kenya, as per classification by CBK based on majority shareholding by the government of Kenya. Sampling was not applied in this study because of the small population size.

3.4 Data Collection

The study obtained data for the 3 banks; Return on assets ratios, credit risk ratios, value of ATM transactions, value of RTGS transactions, value of mobile phone transactions for each bank and total bank assets (bank size) for 12 years. This study used secondary data collection methods with data obtainable from CBK's bank supervision annual reports, national payments system statistics on CBK website and the public commercial banks' published financial reports on their website.

The scope was a twelve- year period (2006 to 2017), during which fast-paced technological revolutions birthed financial innovations that have impacted bank profitability in Kenya. The main data collection instruments employed were computerized techniques.

3.5 Study Variables

The variables of the study were classified into two; dependent and independent variables. The dependent variable is bank profitability connoted by ROA, of each public commercial bank in Kenya. The independent variables were four; Values of transactions from RTGS, ATM, Mobile Phone banking and Credit Risk.

3.6 Diagnostic Tests

At 95% confidence level, the t-test and F-test was used in determining statistical significance of the analytical model. Whereas significance of regression coefficients was tested by t – test and significance of the overall regression model tested using F-test. The significance of each independent variable was tested at a confidence level of 95%. Significance of innovation variables as predictors of bank profitability. A correlation analysis was also performed to find how the variables relate to each other in the model

3.7 Data Analysis

This involves organization of data to produce explanations. It results in giving meaning to the results of statistics established in a manner and language understandable by the source, the researcher and the end user of the research report (Cooper and Schindler, 2001). Data analysis was done using a multilinear regression model of the form below for the consolidated data:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where:

Y = Profitability (ROA)

X₁ = Standardized Value of Automated Teller Machine (ATM) Transactions

X₂ = Standardized Value of Real time Gross Settlements (RTGS) Transactions

X₃ = Standardized Value of Mobile Phone Banking Transactions

X₄ = Credit Risk

β₀ = Constant (y intercept)

β = Coefficient

ε = Error term

The study variables were measured as shown in the table below:

Variable	Proxy	Variable Description	Measurement
Profitability	Y	Efficiency of asset utilization in generating banking income	Net income / Total assets
ATM	X ₁	Use of automated teller machines to carry out banking operations	Value of ATM transactions / Total bank assets
RTGS	X ₂	Use of RTGS in the performance of banking operations	Value of RTGS transactions / Total bank assets
Mobile Banking	X ₃	Use of mobile phones to execute banking transactions	Value of Mobile Phone Banking transactions / Total bank assets
Credit Risk	X ₄	Non-performing loans versus total loans issued	NPLs/ Total Loans

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter explains data collection and analysis, gives the study findings and an in depth understanding of the findings.

4.2 Descriptive Statistics

Descriptive statistics were used to bring out the basic characteristics of the research data analyzed. They summarized features displayed by the data samples studied in a more meaningful way. This study used measures of mean, standard deviation and charts to describe data distribution. In the table 4.1 below, majority of the variables have a small standard deviation meaning that the statistical data set is close to the mean of the data set hence low variability.

Variable	Mean	Std. Deviation	N
ROA	.0134612	.01278634	36
ATM	.0224739	.02757567	36
RTGS	8.6223950	2.35022034	36
MOBILE	.4910953	.30122736	36
CREDIT RISK	.0526056	.04490489	36

Table 4.1: Mean and Standard Deviation

In the chart below, the analysis also found that the expected cumulative probability versus the observed cumulative probability distribution plots yielded a positive linear movement indicating that the variable distributions were ideal.

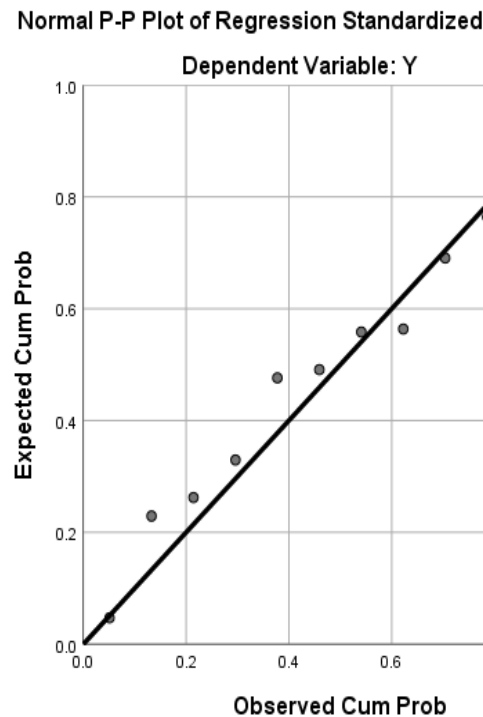


Chart 1: Normal Probability plot

4.3 Diagnostic Tests

Diagnostic tests were used to establish the validity of the regression model. F-test was used in determining statistical significance of the overall analytical model. Whereas significance of regression coefficients was tested by t – test.

Table 4.2 below shows that the r-squared for the overall regression model was 0.954 meaning that the independent variables can reliably be used to account for 95.4 % of

changes in the profitability of Public commercial banks. Therefore the regression model has a strong explanatory power with only about 4.7% of changes in profitability being unexplained by the model.

Model	R	R Square	Adjusted R Square
1	.977a	.954	.928

Table 4.2: Regression Model Summary

Table 4.3 below gives the analysis of variances (ANOVA) within model. It indicates that the model had an F-ratio of 10.934 significant at 10 % level of significance, meaning that the overall regression model is statistically significant. The model is fit for prediction purposes at a significance level of 10%. Also, that the independent variables were statistically significant in predicting the profitability of public commercial banks.

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	62.344	4	15.586	10.934	.000 ^b
Residual	44.190	31	1.425		
Total	106.534	35			

Table 4.3: Analysis of Variances in the Regression Model

Table 4.4 below gives the statistical significance of the independent variables within the model. The results indicate that the t-ratio for value of sector ATM transactions for year was 2.704, 3% significant at 5% level of significance meaning that the value of ATM transactions are a significant predictor of profitability of public commercial banks in Kenya. The estimated coefficient of value of the sector ATM transactions was 0.149 indicating that value of ATM transactions is positively related to profitability of public commercial banks.

Value of RTGS transactions had a coefficient estimate of 0.002 indicating a positive relationship between sector RTGS transactions and profitability. A t-ratio of 2.869 at 5% level of significance indicated that the value of RTGS transactions is a significant predictor of sector profitability. The interpretation being that when the value of RTGS transactions increase, then the profitability also increases.

Value of Mobile Phone transactions had a coefficient estimate of -0.012 showing a negative relationship between value of mobile phone transactions and bank profitability. A t-ratio of -2.696 at 5% level of significance indicated that the value of mobile phone transactions is a significant predictor of sector profitability. As the value of mobile phone transactions increase, bank profitability decreases and vice versa.

Level of sector credit risk had a coefficient estimate of -0.108 indicating a negative relationship between sector credit risk and bank profitability. A t-ratio of -4.110 at 5% level of significance indicated that the level of credit risk is a significant predictor of

sector profitability. Therefore an increase in the level of credit risk results in a corresponding decrease in bank profitability.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	Beta	Std. Error	Beta		
Constant	.008	.005		1.369	.213
ATM	.149	.055	.322	2.704	.030
RTGS	.002	.001	.302	2.869	.024
Mobile Phone	-.012	.004	-.285	-2.696	.031
Credit Risk	-.108	.026	-.378	-4.110	.005

Table 4.4: Test of Significance of Independent Variables

4.4 Correlation Analysis

This involved investigating the relationship between the study variables to show whether and how strongly pairs of variables are related.

Also, Collinearity diagnostics were conducted to investigate the level of inter-correlations between independent variables testing the suitability of the model. Table 4.5 below indicates that most of the Eigen values are not close to zero thus indicating that the predictors are lowly inter-correlated and that small changes in the data values will not lead to large changes in the estimates of the coefficients. The model is thus fit for prediction uses.

Model	Dimension	Eigen value	Condition Index
1	1	3.829	1.000
	2	.819	2.162
	3	.253	3.891
	4	.080	6.912
	5	.019	14.231

Table 4.5: Test of Independent variables Collinearity

Karl Pearson's correlation coefficient analysis was conducted to establish the nature of correlation between the study variables. As per the results in Table 4.6 below, positive correlation coefficient values between profitability and ATM, profitability and RTG, indicate that there is a positive correlation between profitability and value of ATM transactions as well as between profitability and value of RTGS transactions at 5% significance level. An increase in values of ATM and RTGS transactions would result in an increase in bank profitability.

Negative correlation coefficients between profitability and Mobile Phone, profitability and Credit Risk, indicate that there is a negative correlation between profitability and value of Mobile Phone transactions as well as between profitability and level of credit risk at 5% significance level. An increase in values of Mobile Phone transactions and levels of credit risk would result in a decrease in bank profitability.

Correlation between the independent variables also displayed an interesting pattern, at 5% significance level. Changes in ATM and RTGS transactions would move in the same direction (positive coefficients, 0.598) but move in opposite direction with changes in both Mobile Phone and Credit risk (negative coefficients, -0.603, -0.314 and -0.348., 0.391 respectively). However, Mobile Phone and Credit risk share a positive correlation (positive coefficient, 0.384) between the two and a negative correlation with both ATM and RTGS (negative coefficients, -0.729, -0.603 and -0.707, -0.314 respectively). This implies that an increase in value of mobile phone transactions will raise credit risk level and vice versa. Whereas any increase in both mobile phone and credit risk values will cause a decrease in ATM and RTGS transaction values.

	ROA	ATM	RTGS	MOB	C.RI	
Pearson Correlation	ROA	1.000	.793	.742	-.729	-.707
	ATM	.793	1.000	.598	-.603	-.314
	RTGS	.742	.598	1.000	-.348	-.391
	MOB	-.729	-.603	-.348	1.000	.384
	C.RI	-.707	-.314	-.391	.384	1.000

Table 4.6: Correlation between ROA, ATM, RTGS, Mobile Phone and Credit Risk

4.5 Hypotheses Testing

One – way ANOVA test was used to test the study hypotheses. The study sought to test the following hypotheses at 5% significance level, where alpha value, $\alpha=0.05$.

Null hypothesis,

H0: $\mu_1 \neq \mu_2$ (there is no positive effect in bank profitability as a result of financial innovation)

Alternative hypothesis,

H1: $\mu_1 = \mu_2$ (there is positive effect in bank profitability as a result of financial innovation)

Table 4.7 below indicated that the p-values for all the financial innovations except Mobile banking (0.384, 0.062 and 0.524) were more than the alpha value of 0.05 thus we rejected the null hypothesis and accept the alternative hypothesis, concluding that there is positive effect in bank profitability as a result of financial innovation. Mobile banking had a p- value of .002 which is less than our alpha value of 0.05 thus accept null hypothesis that there is a negative effect on bank profitability as a result of mobile banking.

		Sum of Squares	df	Mean Square	F	Sig.
ATM	Between Groups	.024	32	.001	1.649	.384
	Within Groups	.001	3	.000		
	Total	.025	35			
RTGS	Between Groups	153.185	32	4.787	7.358	.062
	Within Groups	1.952	3	.651		
	Total	155.137	35			
MOBILE BANKING	Between Groups	2.831	32	.088	68.763	.002
	Within Groups	.004	3	.001		
	Total	2.835	35			
CREDIT RISK	Between Groups	8697.331	32	271.792	1.174	.524
	Within Groups	694.479	3	231.493		
	Total	9391.810	35		1.649	

Table 4.7: One-way ANOVA Test for Hypotheses

4.6 Discussion

Analysis results indicated that the independent variables (ATM, RTGS, Mobile Phone and Credit Risk) can be used to predict profitability of public commercial banks in Kenya. The said variables had a 95.4% predictive power in that they could explain 95.4%

of any movements in bank profitability, with only 4.6% of variables changes remaining unexplained. The model yielded an F-ratio of 36.347 at 5% level of significance, indicating that the independent variables and the overall regression model were statistically significant in making the study predictions.

Test of significance results indicated a positive relationship between bank profitability and both ATM and RTGS (t-values 2.704 and 2.869) throughputs meaning that any increase in annual values of ATM and RTGS transactions would cause an increase in bank profitability and vice versa. However t-values of -2.696 and -4.110 from Mobile banking and Credit risk indicate a negative correlation with regard to bank profitability. An increase in mobile banking annual throughput causes a decrease in profitability. This could be explained by the decrease in bank income as a result of low banking charges associated with mobile banking services. An increase in credit risk reduces bank profitability due to reduced bank income resulting from increased non-performing loans and vice versa.

Collinearity diagnosis was done to establish the suitability of the regression model. Test results yielded Eigen values above zero for all the independent variables meaning that the variables are lowly interrelated. Thus any slight changes in one variable will not cause a significant change in the others. The overall model is therefore fit for prediction purposes.

Correlation coefficients between the independent variables indicated that ATM and RTGS throughputs have a positive correlation with each other (0.598, at 5% significance level) thus any increase in ATM would result in an increase in RTGS transaction values. However both ATM and RTGS have a negative correlation with Mobile banking and level of credit risk (negative coefficients, -0.729, -0.603 and -0.707, -0.314 respectively). This could be explained by the fact that ATM and RTGS are a set of older payment system gradually being replaced by mobile banking system which is more efficient, modern and less costly. The adoption of mobile phone loaning system (for instance M-Shwari) has exposed the banks to increased credit risk due to lack of a solid regulatory framework around such mobile loans hence high values of non-performing loans. Thus the positive correlation between mobile banking and credit risk (0.384).

Findings in this study are consistent with those of other researchers in this area of study. Taking the arguments by Noyer (2007), where he asserted that financial innovations in the banking sector had been grown largely by immense research in products, services and efficient distribution channels through mobile banking, online banking and efficient payment systems. According to him, such innovative developments improve bank profitability. Oloo (2007) found that the entry of new players in the financial market comes with new energy that pushes for low cost banking services due to the competition for customers through cost effective financial innovations. In effect, there is growth in bank performance due to the efficiency of operations. In another study by Mwangi (2007), mobile money transfers have reduced the need for customers to hold bank accounts. This has triggered the banks to embrace such services as M-Pesa platform into

banking which was first launched by Kenyan mobile operator Safaricom in 2007. Such financial service innovations have had their undeniable effect on bank income and general financial performance.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This section gives a presentation of findings' summary, conclusions drawn from the findings, the researcher's recommendations to banking industry policy implementers and other stakeholders, suggestions for further study in this same area of research as well as limitations or challenges that the researcher faced in the course of study.

5.2 Summary of Findings

The study obtained sectoral data for all the three public commercial banks as classified by CBK. Data was analyzed using SPSS software by running multilinear regression analysis to yield overall model suitability, descriptive statistics, variables collinearity, significance and correlation measures. Study results indicated that the independent variables; ATM, RTGS, Mobile banking and credit risk could explain 95.4 % of variation in bank profitability. Therefore they could be used to predict bank profitability of public commercial banks. The regression model had a strong explanatory power of 95.4% with only 4.6% variations in bank profitability not explained by the model.

Test of significance results indicated a positive relationship between bank profitability and both ATM and RTGS (t-values 2.704 and 2.869) throughputs meaning that any increase in annual values of ATM and RTGS transactions would cause an increase in bank profitability and vice versa. However t-values of -2.696 and -4.110 from Mobile

banking and Credit risk indicate a negative correlation with regard to bank profitability. An increase in mobile banking annual throughput causes a decrease in profitability. This could be explained by the decrease in bank income as a result of low banking charges associated with mobile banking services. An increase in credit risk reduces bank profitability due to reduced bank income resulting from increased non-performing loans and vice versa. Positive t- ratios between ROA and ATM and RTGS indicated a positive relationship between bank profitability and both ATM and RTGS (t-values 2.704 and 2.869) throughputs meaning that any increase in annual values of ATM and RTGS transactions would cause an increase in bank profitability and vice versa. On the other hand, negative t-values of -2.696 and -4.110 from Mobile banking and Credit risk indicate a negative correlation with regard to bank profitability. An increase in mobile banking values results in reduced profitability whereas an increase in credit risk reduces bank profitability. Collinearity diagnostics gave Eigen values above zero for all the independent variables meaning that the variables are lowly interrelated. Thus any slight changes in one variable will not cause a significant change in the others. The overall model is therefore fit or suitable for prediction purposes.

Correlation coefficients between ATM and RTGS throughputs are (0.598, at 5% significance level) thus any increase in ATM would result in an increase in RTGS transaction values. However, both ATM and RTGS have a negative correlation with Mobile banking and level of credit risk (negative coefficients, -0.729, -0.603 and -0.707, -0.314 respectively). Variations in ATM and RTGS throughputs would cause variations in the opposite direction in both mobile banking and credit risk. Any in mobile banking

transaction values would result in a decrease in ATM and RTGS transaction values. This is true in that the use of mobile phones have greatly reduced the use of the conventional methods of funds transfer that were facilitated by the ATMs and the RTGS money transfers. This is because of the lower banking charges, time saving, ease of use, almost instant access to the services that come with the mobile banking technology. Also, the reduction in ATM and RTGS banking services that results in increased use of mobile banking services does come with increased credit risk within the banks. This is due to the increased number of unsecured loans that are nowadays accessible via the mobile banking platforms, for instance, the Nat625 by National Bank of Kenya, that gives personal unsecured loans via MPESA that is mobile phone enabled.

5.3 Conclusion

The study concludes that financial innovation does improve bank profitability but not all forms of financial innovation always spur profitability. This is evidenced by the positive correlation between profitability and both Automatic Teller Machines and Real Time Gross Settlements, but a negative correlation between profitability and mobile banking as well as innovations around loans and loaning products. Legacy payment systems are being replaced with more efficient, less costly modern systems over time, as seen with the negative correlation between ATM, RTGS and Mobile banking. However, some innovations are adopted by the banks for reasons of customer retention due to the efficiency and cost saving they provide to customers, not necessarily for bank profitability purposes. This is explained by the increasing provision of Mobile banking services despite the negative effect on bank profitability. Mobile banking comes with less

bank income as compared with traditional payment systems hence the reduction in profitability.

The study also concludes that there is a logical interrelationship between the independent variables. The use of ATMs and RTGS systems is considered as the some of the earlier innovations in the bank payment systems which have faced a huge competition from the newest more efficient banking innovations for instance the use of mobile banking technology. Thus the study found that both ATMs and RTGS have a negative relationship with Mobile banking. As the use of the latter has been rising steeply over the years, the replacement of old banking solutions that were once considered innovations has been taking place at a considerably high speed. Financial innovations amongst the public banking sector in Kenya has thus been facing internal evolutions from better to best, all in an effort to positively impact the performance of the banks not necessarily on their profitability but on other aspects for example, market power.

Financial innovations in the pubic banking sector have exposed the banks to increased banking risk thus creating a necessary evil. This is evidenced by the positive correlation between Mobile banking and Credit risk. The use of mobile banking has enabled the banks to tap on the unbanked market sector that cannot access the formalized banking services that come with opening physical bank accounts and documentation compliance. Thus banks have resulted to issuing unsecured loans via Mpesa which is mobile banking enabled to satisfy existing market thirst for funds. This has resulted in increased levels of credit risk experienced by the banks.

5.4 Recommendations

The banks are urged to invest in the innovation and adoption of highly efficient financial systems especially anchored on technology that bring speed, ease of use, easy accessibility and cost saving to customers. This is a baseline requirement that will ensure customer retention, high transaction volumes per time which translate into transaction charges that feed into bank income and hence profitability. Recommendation is also given to the government through its financial sector regulators to put in place regulation frameworks and policies that create conducive environment for banks to innovate and at the same time provide adequate controls around the resulting financial systems. These controls will ensure that the financial system does not collapse due to financial moral hazards.

Both the Kenyan government and the public banks' management should create strong innovative collaborations with companies that provide the technological and the technical platforms on which financial innovations are built or facilitated. For example the telecommunications companies that support mobile banking like Safaricom and Airtel. The government could foster a vibrant innovative environment through operational incentives, while the banks make maximum use of these opportunities to boost their banking activities.

Banks' top management should work towards the mitigation of the negative effect caused by some of the financial innovations as identified by this study. As agreeable, some of the innovations are necessary for other valid reasons of customer retention and acquiring

market power. The use of mobile banking reduces bank profitability as compared to other forms of money transfer and it also increases the level of credit risk but it does retain customers. Bank management should thus work with the telecommunication subscriber to enable increasing the security of mobile loans and also seek to multiply the volumes of mobile banking transactions that translate into higher relative income.

The implementation of the above recommendations will see the Kenyan economy grow tremendously due to the resulting speed and integrity of doing business transactions in Kenya. An efficient and secure financial system attracts both local and global investors not only in the financial sector but also in other economic sectors. Therefore both the public and private financial system players need to participate in financial innovations.

5.5 Suggestions for Further Research

This study considered public commercial banking subsector only, thus it would be of value to carry out a further study on the private banking counterparts. To establish the effect financial innovations have on the profitability of private commercial banks. Such study would be of high interest since profit making is mostly the main objective of private entities especially in the banking sector. This would also provide a basis for comparison thus more informed decision making would be done with regards to investments and level of financial innovation inputs required in either sectors.

Another suggestion for further study would be on the factors that affect financial innovation amongst public commercial banks in Kenya. This would be useful to banks'

management in putting up strategies that mitigate on negative factors that slow the much needed financial innovations as well as embracing factors that spur innovations for improved bank performance. This would also inform decision makers in terms of innovation investments which have a direct impact on the larger economy.

Lastly, further research should be carried out on the other forms of financial innovations, since this study concentrated on only three forms. Other exiting types of financial innovations that are found in the public sector banking should also be investigated. These include Internet banking and Agency banking that has caused evolutions in the banking sector substantially.

5.6 Limitations of the Study

The researcher encountered challenges in the area of data collection. The payment system transaction values were only available on a consolidated sector value basis. It therefore meant tedious computations to apportion these values to the public commercial banks. Availability of such data on a public-private banking sector basis would have made data collection easier as well as increase the precision of the regression analysis results.

There have been no previous local studies in this specific area of financial innovations and in public banking sector only, creating a literature limitation. This challenged the researcher to embark on a unique consideration with no pre-existing direct reference materials which involved a lot of fresh thinking and meditations. The researcher labored in using her deductive skills to understand sector specific details on financial innovations.

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APPENDICES

APPENDIX I: Consolidated Bank Profitability (ROA)

CONSOLIDATED BANK PROFITABILTY	
Year	ROA
2017	-0.75%
2016	-0.42%
2015	0.02%
2014	0.65%
2013	0.97%
2012	1.17%
2011	2.18%
2010	3.06%
2009	2.65%
2008	2.70%
2007	2.23%
2006	1.70%

Source: CBK 2018.

APPENDIX II: Consolidated ATM, RTGS, Mobile Banking Values & Credit Risk

CONSOLIDATED VALUES OF ATM, RTGS, MOBILE BANKING TRANSACTIONS, TOTAL BANK ASSETS & CREDIT RISK RATIOS					
Year	ATM Transaction Values (Kshs-millions)	RTGS Transaction Values (Kshs-millions)	MOBILE PHONE Transaction Values (Kshs-millions)	Total Banks' Assets (millions)	Credit Risk (Total NPL/Total Loans)
2017	309.7	690.7	109,154.2	139,718.0	40.58%
2016	416.2	1,046,068.5	120,783.8	145,450.0	43.70%
2015	436.9	1,257,179.3	119,684.2	156,374.0	16.10%
2014	1,710.4	1,147,698.6	106,493.6	154,896.0	10.60%
2013	7,496.1	988,367.4	82,908.0	124,853.0	10.50%
2012	6,479.6	821,026.1	63,800.5	98,573.0	7.70%
2011	6,661.0	1,035,577.2	55,300.8	93,506.0	4.10%
2010	5,681.4	825,965.3	35,366.2	81,156.0	4.30%
2009	4,612.2	683,736.9	23,244.5	68,181.0	9.60%
2008	3,198.1	785,750.6	7,579.0	56,765.0	22.00%
2007	2,380.3	505,890.2	870.2	62,489.0	4.10%
2006	1,176.1	500,951.1	136.4	78,025.0	16.10%

Source: CBK, 2018.

APPENDIX III: ROA, ATM, RTGS, MOB, CREDIT RISK & TOTAL ASSETS

Bank	Year	ROA	Value of ATM Transactions (Millions) Kshs	Value of RTGS Transactions (Millions) Kshs	Value of Mobile Phone Banking Transactions (Millions) Kshs	Credit Risk	Total Bank Assets (Bank size) (Millions) Kshs
Bank 1	2017	0.67%	244.6551	690,683.412	86,231.8338	40.58%	109,942
NBK	2016	0.14%	335.2980	842,666.253	97,298.0450	43.7%	115,114
	2015	-1.34%	351.5418	1,011,659.564	96,310.5858	16.1%	125,295
	2014	1.90%	1,371.3840	920,203.740	85,384.5840	10.6%	122,865
	2013	1.9%	5,828.4270	768,478.354	64,462.8501	10.5%	92,493
	2012	1.7%	4,706.7600	596,387.010	46,344.2100	7.7%	67,155
	2011	3.56%	5,055.6175	785,987.779	41,972.4922	4.1%	66,665
	2010	4.49%	4,375.7244	636,147.156	27,238.5803	4.3%	60,027
	2009	4.13%	3,569.4920	529,165.010	17,989.6370	9.6%	52,327
	2008	4.0%	2,537.3968	623,419.708	6,013.2247	22.0%	44,588
	2007	3.1%	1,964.7645	417,575.423	718.2724	16.4%	52,098
	2006	1.3%	991.1272	422,169.063	114.9764	6.8%	70,125
Bank 2	2017	-3.26%	26.8398	75,771.176	9,460.0324	25.1%	13,456
CB	2016	-1.99%	34.6860	87,172.371	10,065.3150	19.8%	13,918
	2015	0.35%	38.0323	109,448.549	10,419.5663	19.3%	14,136

	2014	-1.82%	156.1854	104,800.982	9,724.3554	26.1%	15,077
	2013	-0.8%	859.6500	113,344.890	9,507.7950	49.4%	16,779
	2012	1.0%	1,035.4872	131,205.142	10,195.7262	53.2%	18,001
	2011	1.61%	957.6100	148,877.908	7,950.2214	47.8%	15,318
	2010	2.46%	717.5247	104,314.453	4,466.5414	49.4%	10,479
	2009	1.54%	479.0634	71,019.515	2,414.3987	44.6%	7,565
	2008	1.5%	274.1232	67,350.052	649.6281	39.7%	5,543
	2007	0.5%	194.2181	41,277.571	71.0016	34.8%	5,392
	2006	0.4%	94.4888	40,247.355	10.9612	29.3%	4,100
Bank 3	2017	0.35%	38.1951	107,828.212	13,462.3538	21.56%	16,320
DBK	2016	0.58%	46.2480	116,229.828	13,420.4200	25.7%	16,418
	2015	1.05%	47.2834	136,071.169	12,954.0554	20.6%	16,943
	2014	1.88%	182.8512	122,693.832	11,384.6112	14.2%	16,954
	2013	1.8%	808.0710	106,544.197	8,937.3273	34.2%	15,581
	2012	0.8%	737.3924	93,433.965	7,260.5929	36.7%	13,417
	2011	1.37%	647.7950	100,711.526	5,378.0909	39.5%	11,523
	2010	2.22%	588,135,000	85,503.650	3,661,099,500	49.8%	10,650
	2009	2.27%	563,604,000	83,552.370	2,840,469,000	52.8%	8,289
	2008	2.6%	386,584,000	94,980.842	916,142,260	52.1%	6,634
	2007	3.1%	221,318,300	47,037.232	80,908,844	53.6%	4,999
	2006	3.4%	90,468,000	38,534.702	10,494,801	49.4%	3,800

Source: CBK 2018.