EFFECTS OF TECHNOLOGICAL INNOVATIONS ON FINANCIAL PERFORMANCE OF COMMERCIAL BANKS IN KENYA

BY

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DECLARATION

I declare that this research project is my original work and has not been presented for a degree in any other university. All references made to works of other persons have been duly acknowledged.

SIGNED…… DATE……..

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D61/62727/2010

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

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DEDICATION

This project is dedicated to my family for their unending love, care and support and to all the commercial banks in Kenya.

ABSTRACT

Banking technology is generally a bundle or package of different technological elements such as improved varieties of products and services (processes). Implementation of information technology and communication networking has brought revolution in the functioning of the banks and the financial institutions. The objective of this study was to establish the effects of technological innovations on financial performance of commercial banks in Kenya.

The study adopted descriptive survey as it provided for explanation of the cause and effect between independent variables and the dependent variables. This was a census study and the target was all commercial banks in Kenya. More specifically the target population was forty three Commercial Banks based on latest available information from Central Bank of Kenya. Secondary data was used in this study. In order to situate the study theoretically and produce the conceptual framework the secondary sources were obtained from, financial and annual statements of the banks over a period of 5 years (2008-2012) and publications were also used. The financial data was collected from the annual reports which were used to get ROA and other information related to the variables.

From the findings, a steady rise in return on assets values from 2009 indicated that the banks' financial performance has been very well over the last 3 years in Kenyan financial industry. A significant positive relationship between mobile banking and financial performance was also established by the study. The study as well established a significant positive relationship between Electronic Funds Transfer at Point of Sale Terminals and financial performance. The study concluded that the adoption of technological innovation has enhanced Kenyan banking industry by making it more productive and effective and has a strong positive relationship on the overall banking performance by making workers performance more effective and efficient; the adoption of technological innovation has enhanced the fortune of the Kenyan commercial banks. The study recommended that banks must be focused in terms of their needs and using the right technology to achieve goals, rather, than acquiring technology because other banks have it. Regulatory authorities like Central Bank of Kenya must stipulate standards for the banks to follow to avoid making Kenya Banking Sector a dumping ground for the outdated technological infrastructures.

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ABBREVIATIONS

ATMs	Automated Teller Machines
BIS	Bank for International Settlement
CBK	Central Bank of Kenya
EFTPoS	Electronic Funds Transfer at Point of Sale
EN	Enterprise Network
GIA	Global Industry Analysts,
ICT	Information and Communication Technology
IT	Information Technology
KEPSS	Kenya Electronic Payment and Settlement System
MICR	Magnetic Character Ink Reader
NIM	Net Interest Margin
OCC	Office of the Comptroller of the Currency
PoS	Point of Sale
PC	Personal Computer
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
ROA	Return on Asset
ROE	Return on Equity
RTGS	Real Time Gross and Settlement
SMEs	Small and Medium Enterprises
SMS	Short Messages
SPSS	Statistical Package for Social Sciences
UK	United Kingdom
USA	United States of America
TAM	Technology Acceptance Model
WAN	Wide Area Network

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Banking technology is generally a bundle or package of different technological elements such as improved varieties of products and services (processes). Banking technology consists of two components; a hardware aspect consisting of the tool that embodies the technology as a material or physical object such as machines; and software aspects, consisting of the information base for the tool such as technical knowledge and skills about how to use the hardware aspect of technology (Rogers, 1995). Technological efficiency can result in lower transaction costs and increased revenue for banks. For instance, technology can allow banks to cross-market new and existing products to customers.

Technological innovation activities include the inter-organizational processes of market-based sell-buy relationships and collaboration (and consumer-oriented activities (business-to-consumer and consumer-to-consumer), as well as the intra-organizational processes that supports them (Zwass, 2003). Organizations are embracing e-commerce as a means of expanding markets, improving customer service, reducing costs, and enhancing productivity. Efficiencies are experienced in marketing and advertising; new technologies make disintermediation possible, eliminating the middleman (Turban et al., 2004). Other efficiencies include reduced inventory and round the clock access at no additional cost. Superior banking technologies enable higher customization (Choi & Whinston, 2000) allowing organizations to improve customer service. A vital benefit of an integrated banking technology is access to global markets which enables businesses to expand their

reach. A study of the technologies progress in the banking sector is important because banks play an important role in providing, financing and mobilizing savings, especially in emerging markets as compared to mature markets (Rishi & Sweta, 2004). Technology affects the core of the banking business of information processing and delivery. In this respect, banking is no different from other industries. It is largely innovation, and what follows from it, that will transform the banking and financial services industries (Cooper, 1998).

1.1.1 Technological Innovations

Technological innovation can be considered as a package of innovations (Zwass, 2003; Molla, 2006). Rogers (1995) defines organizational innovation as the development and implementation of ideas, systems, products, or technologies that are new to the organization adopting it. The adoption of innovations is a process that includes the generation, development, and implementation of new ideas or behaviours (Rogers, 1995). The innovation does not necessarily have to be new in terms of discovery or invention; it only has to be perceived as new by the organization.

Technological innovations have been identified to contribute to the distribution channels of Banks. The electronic delivery channels are collectively referred to as Electronic Banking. Electronic Banking is really not one technology, but an attempt to merge several different technologies. Each of these evolved in different ways, but in recent years different groups and industries have recognized the importance of working together. Bankers now see a kind of evolution in their business, partly, because the world has taken a quantum leap in the use of technologies in the last several years (Porteous, 2006). Mobile Banking refers to provision of bank-related

financial services with the help of mobile telecommunication devices. The scope of offered services may include facilities to conduct bank and stock market transactions, to administer accounts and to access customized information. Banks offering mobile access are mostly supporting some or all of the following services: Account Balance Enquiry, Account Statement Enquiries, Cheque Status Enquiry, Cheque Book Requests, Funds Transfer between Accounts, Credit/Debit Alerts, Minimum Balance Alerts, Bill Payment Alerts, Bill Payment, Recent Transaction History Requests, and Information Requests like Interest Rates/Exchange Rates (Porteous, 2006).

The idea of Internet banking according to Essinger (1999) is: "to give customers access to their bank accounts via a web site and to enable them to enact certain transactions on their account, given compliance with stringent security checks". To the Federal Reserve Board of Chicago's Office of the Comptroller of the Currency (OCC) Internet Banking Handbook (2001), Internet Banking is described as "the provision of traditional (banking) services over the internet". Internet banking by its nature offers more convenience and flexibility to customers coupled with a virtually absolute control over their banking. Service delivery is informational (informing customers on bank's products, etc.) and transactional (conducting retail banking services).

Cloud computing, which in the most basic of terms offers unlimited computing resource as a service on a pay-per-use basis, is proven to directly translate to less upfront, capital expense and reduced IT overheads, offering a cost-effective, simple alternative to accessing enterprise-level IT without the associated costs. Cloud computing has the capacity to change completely the financial services landscape. By

making enterprise-level banking systems and associated technologies available in the cloud on a pay-per-use basis, now anyone, anywhere can have access to modern core banking systems without the cost and other barriers usually associated with this technology. (www.temenos.com).

Networking of branches is the computerization and inter-connecting of geographically scattered stand-alone bank branches, into one unified system in the form of a Wide Area Network (WAN) or Enterprise Network (EN); for the creating and sharing of consolidated customer information/records. An Electronic Funds Transfer at the Point of Sale is an on-line system that allows customers to transfer funds instantaneously from their bank accounts to merchant accounts when making purchases (at purchase points). A POS uses a debit card to activate an Electronic Fund Transfer Process (Chorafas, 2010).

1.1.2 Financial Performance of Commercial Banks

According to Khrawish (2011), profit is the ultimate goal of commercial banks. All the strategies designed and activities Performed thereof are meant to realize this grand objective. However, this does not mean that Commercial Banks have no other goals. Commercial banks could also have additional social and economic goals. However, the intention of this study is related to the first objective, profitability.

To measure the profitability of commercial banks there are variety of ratios used of which Return on Asset, Return on Equity and Net Interest Margin are the major ones ROE is a financial ratio that refers to how much profit a company earned compared to the total amount of shareholder equity invested or found on the balance sheet. ROE is the ratio of Net Income after Taxes divided by Total Equity Capital .ROA is also another major ratio that indicates the profitability of a bank. It is a ratio of Income to

its total asset It measures the ability of the bank management to generate income by utilizing company assets at their disposal (Khrawish, 2011).

1.1.3 Effects of Technological Innovations on Financial Performance of Commercial Banks

At the organizational-level, innovation has been shown to be positively related to individual firm performance (Goosen, 2002). One key industry where there are calls for greater levels of innovation is the retail banking sector. The retail banking sector is currently struggling as it comes under greater competitive pressure from a number of sources. Customers are becoming more demanding. Banking services are gradually being seen as commodities (Onufrey, et al 2008). Non-banking organizations are increasingly entering the marketplace to compete for customers. Combing these trends, there appears to be a strong impetus for greater levels of innovation to enable individual banks to differentiate themselves in an increasingly competitive marketplace.

Implementation of information technology and communication networking has brought revolution in the functioning of the banks and the financial institutions. It is argued that dramatic structural changes are in store for financial services industry as a result of the Internet revolution; others see a continuation of trends already under way (Yasuharu, 2003). Irechukwu (2000), listed some banking services that have been revolutionized through the use of ICT as including; account opening, customer account mandate, and transaction processing and recording. Information and Communication Technology has provided self-service facilities (automated customer service machines) from where prospective customers can complete their account opening documents direct online. It assists customers to validate their account

numbers and receive instruction on when and how to receive their cheque books, credit and debit cards (Agboola, 2006). The ICT products in use in the banking industry in many developing and developed include Automated Teller Machine, Smart Cards, Telephone Banking, MICR, Electronic Funds Transfer, Electronic Data Interchange, Electronic Home and Office Banking (Agboola, 2006).

It is widely recognized that innovation is key to the economic performance of firms. Innovative firms grow faster in terms of employment and profitability. An innovation is an idea, practice, or object that is perceived to be new by a person or adopting entity. The innovation is not seen as something periodical that happened by accident nor something that results from the action of an individual agent. Innovation is seen as the result of an interactive and non linear process between the firm and the environment. When an innovation emerges, diffusion unfolds which entails communicating or spreading of the news of the innovation to the group for which it is intended (Okunoye et al, 2007). Adoption however is the commitment to and continued use of the innovation. The diffusion of innovations theory provide explanations for when and how a new idea, practice or newly introduced information and communication medium is adopted or rejected over time in a given society (Okunoye et al, 2007).

According to Agboola (2006), the application of information and communication technology concepts, techniques, policies and implementation strategies to banking services has become a subject of fundamental importance and concerns to all banks and indeed a prerequisite for local and global competitiveness. ICT directly affects how managers decide, how they plan and what products and services are offered in the banking industry. It has continued to change the way banks and their corporate

relationships are organized worldwide and the variety of innovative devices available to enhance the speed and quality of service delivery (Agboola, 2006).

However, most research about innovation focused on manufacturing industries though increasing attention has been paid to innovation in service industries recently (Gallouj, 2002; Howells and Tether, 2004; Miles, 2004). The survival of an enterprise in the age of knowledge-based economy depends on how to improve their organizational innovation capability. Technological innovation is the key variable and means of differentiation between logistics service providers. Commercial banks can increase their performance by employing new technologies. They should employ new information technologies to raise their service capability in the e-commerce age (Agboola, 2006).

Internet banking by its nature offers more convenience and flexibility to customers coupled with a virtually absolute control over their banking. Service delivery is informational (informing customers on bank's products, etc) and transactional (conducting retail banking services). As an alternative delivery conduit for retail banking, it has all the impact on productivity imputed to Telebanking and PC-Banking. Aside that it is the most cost-efficient technological means of yielding higher productivity. Furthermore, it eliminates the barriers of distance or time and provides continual productivity for the bank to unimaginable distant customers (Essinger, 1999). Internet Banking helps to give the customer's anytime access to their banks. Customers could check out their account details, get their bank statements, perform transactions like transferring money to other accounts and pay their bills sitting in the comfort of their homes and offices (Porteous, 2006). However the biggest limitation of Internet banking is the requirement of a Personal Computer (PC)

with an Internet connection, not a big obstacle if we look at the US and the European countries, but definitely a big barrier if we consider most of the developing countries of Africa like Kenya. Mobile banking addresses this fundamental limitation of Internet Banking, as it reduces the customer requirement to just a mobile phone (Owens, 2009).

The internet offers a potential competitive advantage for banks and this advantage lies in the areas of cost reduction and more satisfaction of customer needs (Bradley and Stewart, 2003 and Jaruwachirathanakul and Fink, 2005). Encouraging customers to use the Internet for banking transactions can result in considerable operating costs savings (Sathye, 1999). The internet is the cheapest distribution channel for standardized bank operations, such as account management and funds transfer (Polasik and Wisniewski, 2009). Customer dissatisfaction with branch banking because of long queuing and poor customer service is an important reason for the rapid movement to electronic delivery (Karjaluoto, Mattila and Pento, 2002). The commitment of senior management is a driving force in the adoption and exploitation of technology (Shiels, McIvor and O'Reilly, 2003).

According to Porteus (2006), Mobile banking is emerging as a key electronic channel for the global banking and financial services industry. The ubiquitous nature of mobile devices and services, and the ability of mobile banking services to reduce overall operational costs, streamline operations, and expand customer base are expected to boost prospects in the industry. Increasing adoption of mobile phones among general consumers, particularly among the younger generation (in the 18-34 years age group), and rapid rise in demand for mobile payments are expected fuel demand for mobile banking services. The industry is also expected to benefit from

favourable government and regulatory specifications, which are aimed at providing banking services to unbanked customers to promote economic development.

Financial institutions in the present socio-economic environment are dependent on computer support and IT innovation, therefore, to a substantial extent, the banking industry today is clear on what the emerging technology will be. Some useful solutions in the Cloud are already adopted in some organizations and these include: product catalog, enabling one to manage catalogs of products and services, as well as to access pricing information; asset management, permitting one to track the different financial products customers have purchased; data quality management, which ensures that customer, product, and pricing data are available, valid, and free of duplicates; work flow programs that help in customizing sales and marketing documents; collateral management, which provides a valuable repository for the most recent versions of sales and marketing information; list management, assisting the private banker in customer leads, contact information, and business handling; and marketing analytics, which permit studying the impact of marketing campaigns, determining those activities generating the most revenue, and measuring the results of marketing spending (Chorafas, 2010).

Networking of branches offers quicker rate of inter-branch transactions as the consequence of distance and time are eliminated. Hence, there is more productivity per time period. Also, with the several networked branches serving the customer populace as one system, there is simulated division of labour among bank branches with its associated positive impact on productivity among the branches. Furthermore, as it curtails customer travel distance to bank branches it offers more time for customers' productive activities (Abor, 2005). Increased banking productivity results

from the use of EFTPoS to service customers shopping payment requirements instead of clerical duties in handling cheques and cash withdrawals for shopping. Furthermore, the system continues after banking hours, hence continual productivity for the bank even after banking hours. It also saves customers time and energy in getting to bank branches or ATMs for cash withdrawals which can be harnessed into other productive activities (Chorafas, 2010).

Bank for International Settlement (BIS) in their study recognized that safe and efficient retail payment systems enhance the effectiveness of the financial system, boost consumer confidence and facilitate the functioning of commerce. Conceptionally, payment systems are coined as being two-sided markets (Rochet and Tirole, 2006). Virtually every economic transaction involves the use of a payment instrument, such as cheques, electronic funds transfers, and so on (Berger, 2003). Hasan, Schmiedel and Song (2009) in their study to provide a combined and integrated view of the importance and significance of retail payments for bank performance using country level retail payment service data across 27 EU markets found out that countries with more developed retail payment services, banks perform better, in terms of both their accounting ratios and their profit and cost efficiency. They further found that the relationship is stronger in countries with higher levels of retail payment transaction equipment, like ATMs and POS terminals.

1.1.4 Commercial Banks in Kenya

Currently there are there are 43 licensed commercial banks and 1 mortgage finance company (Appendix I). The Companies Act, the Central Bank of Kenya (CBK) Act and the Banking Act are the main regulators and governors of banking Industry in Kenya. These Acts are used together with the prudential guidelines which Central

bank of Kenya issues from time to time. In 1995 the exchange controls were lifted after the liberalization of the banking in Kenya. Kenyan Banks have realized tremendous grow in the last five years and have expanded to the east African region. The banking industry in Kenya has also involved itself in automation, moving from the traditional banking to better meet the growing complex needs of their customer and globalization challenges (Central Bank, 2013).

The Kenyan banking industry has been expanding branch networking amid the introduction of branchless banking system, which include the use of EFTs, ATM cards, SMS banking etc. The annual reports of CBK clearly indicate that, branch network has been slowly expanding since 2002. By the end of December 2006, Kenya had a total branch network of 575, as compared to 486 branches in the period ended December 2002.Further it is indicated that Nairobi province has a large number of branch network while North Eastern province has never added any branch since the year 2000. It has maintained 4 branches in the whole province. This indicates that many Kenyan are left un-banked throughout the country's eight provinces, as banks have customer bases concentrating in major cities. Also, the slow growth of Branches can be attributed to the rapid rise of alternatives, which include electronic financial product through mobile phones and Personal computers (Kihumba, 2008).

Kenyan banks have exponentially embraced the use of information and communication technologies in their service provision. They have invested huge amounts of money in implementing the self and virtual banking services with the objective of improving the quality of customer service. Some of the ICT-based products and services include the introduction of Mobile Banking, ATMs, Internet

Banking, Core banking solution, Electronic clearing systems and direct debit among others. In mid 2005, Kenya's banking Industry moved a milestone by introducing Real Time Gross and Settlement system (RTGS) which was renamed Kenya Electronic Payment and Settlement system (KEPSS). This will facilitate the inter-bank financial data transfer. The development of e-banking services is expected to decongest banking halls and reduce the incidences of long queues in banking halls. Digital– based financial services have made a significant contribution in covering the cost of offering financial services (Kihumba, 2008).

1.2 Research Problem

A fundamental assumption of most recent research in operations improvement and operations learning has been that technological innovation has a direct bearing on performance improvement (Upton and Kim, 1999). Strategic management in financial institutions demand that they should have effective systems in place to counter unpredictable events that can sustain their operations while minimizing the risks involved through technological innovations. Only financial institutions that are able to adapt to their changing environment and adopt new ideas and business methods have guaranteed survival. Some of the forces of change which have impacted the performance of financial institutions mainly include technological advancements such as use of mobile phones and the internet.

A number of studies have concluded that IT has appreciable positive effects on bank productivity, cashiers' work, banking transaction, bank patronage, bank services delivery, customers' services and bank services. They concluded that, these have positive effects on the growth of banking (Balachandher et al, 2001: Idowu et al,

2002; Hunter, 1991; Yasuharu, 2003). Other previous studies like Pooja and Singh (2009), Francesca and Claeys (2010), Batiz-Lazo and Woldesenbet (2006) and Mwania and Muganda (2011) have produced mixed results regarding the impact of innovations on bank performance. Pooja and Singh (2009) and Franscesa and Claeys (2010), in their studies concluded that innovations had least impact on bank performance, while Batiz-Lazo and Woldesenbet (2006) and Mwania and Muganda (2011) concluded that financial innovation had significant contribution to bank performance.

Despite the importance of technological innovations in explaining banking performance, the effects of technological innovation on performance, is still misunderstood for two main reasons; first, there is a lack of understanding about the drivers of innovation and secondly innovation's effects on bank's performance remains untested (Mabrouk & Mamoghli, 2010). There is a knowledge gap on a combined effect of technological innovations on financial performance of commercial banks. Most of the studies considered the effect of a single technological innovation on financial performance and effect of composite of technological innovations has not been tested in Kenya. This study therefore aimed to answer the following research question: Does technological innovation have effects on the financial performance of commercial banks in Kenya?

1.3 Research Objective

To establish the effects of technological innovations on financial performance of commercial banks in Kenya.

1.4 Value of the Study

The findings and recommendations of this study will be useful to the management of commercial banks by enabling them to formulate and target their technological innovation products effectively. The study will benefit the existing the management of commercial banks in understanding the technology challenges facing the banking industry and how to address the problems. Government and policy makers will find the findings and recommendations of this study useful in formulating future banking regulations, policies and laws that will aid in regulating and operationalization of the banking industry in relation to technology and innovation use. Knowledge seekers in the fields of economics, research methods, management, and banking studies will find this research study useful. In particular, this research study will be beneficial to the researchers with research interests in technology and innovations, by serving as a point of reference. In addition, future researchers will be able to formulate further studies based on the recommendations of this study.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter provides theoretical and empirical information from publications on topics related to the research problem. It summarizes the information from other researchers who have carried out their research in the same area of technology and innovation and its influence on performance.

2.2 Theoretical Review

In deriving a framework for this study two existing research frameworks will be considered: The Technology Acceptance Model (TAM) and Theory of Diffusion of Innovations.

2.2.1 The Technology Acceptance Model

TAM is a theoretical model that evaluates the effects of things like system characteristics on user acceptance (Davis, 1986). TAM assumes that a computer user generally acts quite rationally and uses information in a systematic manner to decide whether to adopt, or not to use this technology in the workplace. Davis (1986) identified three major determinants of technology acceptance that relate to cognition and effectiveness and were suggested by previous research studies. He began with the TRA and adapted this as a basis for causal links between perceived usefulness, perceived ease of use, attitude towards using technology and behavioural intention to explain technology adoption.

There is a large body of literature over the last 20 years dealing with TAM. Recent studies include a study of user acceptance of on-line private banking in Finland by

Pikkarainen, Karjaluoto and Pahnila (2004) who found that perceived usefulness and information on an on-line banking web site were the main factors influencing adoption. In evaluating IS usage in Malaysian SMEs, Ndubisi and Jantan (2003) found that there was a positive relationship between computing skill and technical backing and IS usage directly and indirectly via perceived usefulness and ease of use. Schepers and Wetzels (2007) conducted a quantitative meta-analysis of previous research on the technology acceptance model (TAM) in an attempt to make well-grounded statements on the role of subjective norm. Venkatesh et al. (2003) have recently proposed a unified view incorporating aspects of various other models into TAM, but we made no use of their unified model in this research.

According to the TAM, these two beliefs are of primary significance for technology acceptance. PU refers to the prospective user's subjective likelihood that the use of a certain application will increase his or her performance. PEOU is defined as the degree to which the prospective user expects the potential system to be free of effort (Davis et al., 1989). If commercial banks perceive the cost of technological innovations as acceptable, they are likely to adopt it and then use it.

2.2.2 Theory of Diffusion of Innovations

The theory of Diffusion of Innovations as described by Rogers (1995) is well known. Rogers describes diffusion of innovations as: "… the process by which an innovation is communicated through certain channels over time among the members of social systems. It is a special type of communication, in that the messages are concerned with new ideas" (Rogers, 1995). A decision not to adopt an innovation relates to the rejection of the available new idea. However, in order to explain the rate of adoption

of innovations Rogers suggests measurement of the following perceived characteristics of innovations: (1) relative advantage (2) compatibility; (3) complexity; (4) trialability; and (5) observability. Rogers (1995) postulated that the adoption of innovations is influenced by these five characteristics, and that they can explain the rate of technology adoption.

Technology diffusion is an indispensable process through which technological potential of innovative activities can be actually turned into productivity. Various characteristics of the economic environment in which diffusion takes place may affect the pace of diffusion, while the diffusion itself may also have feedbacks on the environment. To better understand this process, many important questions have to be answered. Among them, experts are curious about the following: who are the early adopters of technological innovations, what factors determine the various diffusion rates across adopter groups, and what feedbacks, if any, the diffusion may have on the economic environment. The ongoing diffusion of Internet Banking (IB) provided a good opportunity to look closely at these questions (Gongera, 2013).If a commercial bank in Kenya observes the benefits of technological innovations they will adopt these innovations given other factors such as the availability of the required tools. Adoption of such innovations will be faster in organizations that have internet access and information technology departments than in organizations without.

2.3 Empirical Review

Simpson (2002) suggests that e-banking is driven largely by the prospects of operating costs minimization and operating revenues maximization. A comparison of online banking in developed and emerging markets revealed that in developed

markets lower costs and higher revenues are more noticeable. While Sullivan and Richard (2000) finds no systematic evidence of a benefit of internet banking in US click and mortar banks. Furst, Lang and Nolle (2002) find that federally chartered US banks had higher Return on Equity (ROE) by using the click and mortar business model. Furst, Lang and Nolle (2002) also examined the determinants of internet banking adoption and observed that more profitable banks adopted internet banking after 1998 but yet they were not the first movers. Jayawardhena and Foley (2000) show that internet banking results in cost and efficiency gains for banks yet very few banks were using it and only a little more than half a million customers were online in U.K. Kagan, et al (2005), in their study on whether internet banking affects the performance of community banks found that banks that provide extensive online banking services tend to perform better. They further found out that online banking helps community banks improve their earning ability as measured by return on equity and improved asset quality by reducing the proportion of overdue and underperforming assets.

DeYoung (2005) ,analyzed the performance of Internet only banks versus the brick and mortars in the US market and found strong evidence of general experience effects available to all start-ups. Yet there is little evidence that technology based learning accelerates the financial performance of Internet-only start-ups. He finds that bank profitability is lower for pure-play (internet-only) banks in the US market. In a later study DeYoung, Lang and Nolle, (2007) analyzed the US community banks market to investigate the effect of internet banking on bank performance. They compared the brick and mortar banks performance to click and mortar banks which do have transactional websites over a three year period. Their findings suggest that internet

banking improved bank profitability, via increase in revenues from deposit service charges. Movements of deposits from checking accounts to money market deposit accounts, increased use of brokered deposits, and higher average wage rates for bank employees were also observed for click and mortar banks.

Agboola (2006), in his study on Information and Communication Technology (ICT) in Banking operations in Nigeria using the nature and degree of adoption of innovative technologies; degree of utilization of the identified technologies; and the impact of the adoption of ICT devices on banks, found out that technology was the main driving force of competition in the banking industry. During his study he witnessed increase in the adoption of ATMs, EFT, smart cards, electronic home and office banking and telephone banking. He indicates that adoption of ICT improves the banks' image and leads to a wider, faster and more efficient market. He asserts that it is imperative for bank management to intensify investment in ICT products to facilitate speed, convenience, and accurate services, or otherwise lose out to their competitors.

Hernando and Nieto (2006), studied whether internet delivery channels change bank's performance, they found out that adoption of internet as a delivery channel involved gradual reduction in overhead expenses (particularly, staff, marketing and IT) which translates to an improvement in banks´ profitability. The study also indicates that internet is used as a complement to, rather than a substitute for, physical branches. The profitability gains associated with the adoption of a transactional web site are mainly explained by a significant reduction in overhead expenses. This effect is gradual, becoming significant eighteen months after adoption and reaching a

maximum generally two and a half years after adoption. Their study showed that multichannel banks present statistically significant evidence of efficiency gains that is reduction in general expenses per unit of output. Banks would further profit from cost reductions to the extent that the Internet delivery channel functions as a substitute for traditional distribution channels. Their analysis shows that this effect varies over time and explains, in terms of cost and income structure, the main drivers of better performance.

Shirley and Sushanta (2006), studied the impact of information technology on the banking industry and analyzed both theoretically and empirically how information technology related spending can affect bank profits via competition in financial services that are offered by the banks. (IT related products are internet banking, electronic payments, security investments, information exchanges, Berger, 2003). Using a panel of 68 US banks for a period of over 20 years to estimate the impact of IT on profitability of banks, they found out that though IT might lead to cost saving, higher IT spending can create network effects lowering bank profits. They further contend that the relationship between IT expenditures and bank's financial performance is conditional to the extent of network effect. They say that if network effect is too low, IT expenditures are likely to; reduce payroll expenses, increase market share, and increase revenue and profit.

Kihumba (2008), analyzed the reason for innovation and financial performance of 43 banks between 2000 and 2007, how each factor caused innovation in the Kenyan market and how innovation has increased annual revenue, business volume, customers' turnover and reduced costs of operation, facilitated expansion of market

share and geographical coverage of the bank. He found that, some financial institutions do innovate to utilize their excess capacity and to maximize their revenues within existing capacity.

Malhotra and Singh (2009), in their study on the impact of internet banking on bank performance and risk found out that on average internet banks are larger, more profitable and are more operationally efficient. They also found that internet banks have higher asset quality and are better managed to lower the expenses for building and equipment and that internet banks in India rely substantially on deposits. They further found out that smaller banks that adopt internet banking have been negatively impacted on profitability.

Mabrouk and Mamoghli (2010), in their study on Dynamics of Financial Innovation and Performance of Banking Firms: Context of an Emerging Banking Industry, analyzed the effect of the adoption of two types of financial innovations namely; product innovation (telephone banking and SMS banking and so on) and process innovation (Magnetic strip card (debit, ATM and credit card), Automatic cash dispenser; (Automatic teller machine; Electronic payment terminal and so on) on the performance of banks. Their analysis included two adoption behaviours, first mover in adoption of the financial innovation and imitator of the first movers. They found out that first mover initiative in product innovation improves profitability while process initiative has a positive effect on profitability and efficiency. Banks that imitate are less profitable and less efficient than first mover.

Nader (2011), analyzed the profit efficiency of the Saudi Arabia Commercial banks during the period 1998- 2007. The results of his study indicated that availability of phone banking, number of ATMs and number of branches had a positive effect on profit efficiency of Saudi banks. On the contrary he found that the number of point of sale terminals (POSs), availability of PC banking and availability of mobile banking did not improve profit efficiency.

2.4 Summary of Literature Review.

One study was found which analyzed the reasons for innovation and financial performance of 43 commercial banks in Kenya and was conducted in 2008.These are almost five years since the study was done. There have been major improvements on technological innovations which have increased significantly the access of banking services to majority of Kenyans and significantly reducing the costs of operation. Previous studies have produced mixed results regarding the impact of innovations on bank performance. It is at the center of such mixed conclusions that creates and necessitates the need to carry out a study from a Kenyan context to establish the effects of technological innovations on commercial banks' financial performance.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research methodology that was used, in an attempt to achieve the objectives of the study. Attention is focused on research design, study population or target population, sample size, sampling techniques, data collection instruments, data collection procedure and data analysis procedures.

3.2 Research Design

The study used descriptive survey. Mugenda and Mugenda (2003), support the view that a descriptive research design aids the researcher to formulate a more precise problem statement. This design provides for explanation of the cause and effect between independent variables and the depend variables. The goal of a descriptive study hence is to offer the researcher a profile or to describe relevant aspects of the phenomena industry oriented or other perspective.

3.3 Target Population

The target population was forty three Commercial Banks based on latest available information from Central Bank of Kenya (Appendix I). A census survey was conducted because the population was considerably small and manageable.

3.4 Data Collection

Secondary data was used in this study. In order to situate the study theoretically and produce the conceptual framework the secondary sources were obtained from, financial and annual statements of the banks over a period of 5 years (2008-2012) and

publications were also used. The financial data was collected from the annual reports which were used to get ROA and other information related to the variables.

3.5 Data Reliability and Validity

Validity shows whether the items measure what they are designed to measure (Borg and Gall, 1996). The researcher used content validity to examine whether the instruments answer the research questions (Borg & Gall, 1996). Adjustments and additions to the research instruments consultations and discussions with the supervisor were done to establish content validity. Reliability refers to the consistency of the research and the extent to which studies can be replicated (Wiersma, 1986). To ensure a high degree of reliability of instruments in this study, the researcher personally collected the data and only in a few cases where assistance was sought from well-trained and motivated research assistants.

3.6 Data Analysis

Data obtained from the field in raw form is difficult to interpret; such data must be cleaned, coded, and key punched into a computer and analyzed (Mugenda and Mugenda, 2003). Data collected, was tabulated and analyzed for purpose of clarity, using SPSS software. It is a computer program used for statistical analysis and has the ability to handle statistical presentation with array of formulas for ease of interpretation. Data was presented using tables, and pie charts to make them reader friendly. In addition, a multiple linear regression was used to measure the quantitative data and analyzed using SPSS.

3.6.1 Analytical Model

The analytical model was as follows $Y= \beta 0+ \beta 1X1+\beta 2X2+ \beta 3X3+ \beta 4X4+\varepsilon$

Where:

Y is the dependent variable (financial performance i.e. ROA)

β_0 is the regression constant

$\beta 1$, $\beta 2$, $\beta 3$, $\beta 4$, and $\beta 5$ are the coefficients of independent variables,

X1 is Mobile Banking

X2 is Internet Banking

X3 is Electronic Funds Transfer at Point of Sale Terminals

X4 is Branch Networking

ε is the Error Term.

3.6.2 Variable Measurement

The variables were measured based on the following;

Variable	**Measurement**
Financial performance	Return on Assets
Mobile Banking	Cumulative number of Customers registered in an year
Internet Banking	Number of transactions in an year
Electronic Funds Transfer at Point of	Number of transactions in an year
Branch Networking	Number of branch networks in an year

A multiple linear regression model and t-statistic was used to determine the relative importance (sensitivity) of each independent variable in affecting the performance of

bank Financial Performance was measured using Return on Asset of commercial banks while the influence of each technological innovation was measured based on the regression analysis. In order to find out the relevance effect of technological innovations on financial performance, the results of the study must also be significant. Results are said to be statistically significant within the 0.05 level, which means that the significance value must be smaller than 0.05. The significance was determined by the t-value, which indicates how many standard error means the sample diverges from the tested value.

CHAPTER FOUR
DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents data analysis and interpretation. The objective of the study was to determine the effects of technological innovations on financial performance of commercial banks. Data was collected from all the banks. The data sources included financial statements, annual statements for a period of 5 years (2008-2012) as well as other publications. Data was collected based on the variables of the study, that is Financial performance depicted by Return on Assets; Mobile Banking depicted by the number of Customers registered in an year; internet banking indictaed by the number of transactions in an year; electronic funds transfer at point of sale terminals indicated by the amount transferred or number of transactions in an year as well as branch Networking indicated by the number of branch networks implemented in an year.

4.2 Descriptive Statistics

Table 4.1 Return on Assets (Financial Performance)

Year	N	Mean	Std. Deviation
2009	43	2.34	3.18072
2008	43	2.68	1.62044
2010	43	3.21	3.69108
2011	43	3.97	3.04215
2012	43	4.58	3.42043

The findings as shown in table 4.1 shows the distribution of Return on Assets values over a period of 5 years. The lowest value for ROA was 2.34 in year 2009 while the

highest as 4.58 in 2012. On the other hand, high scores of standard deviation indicate variation in financial performance for the various commercial banks statistically. Nonetheless a steady rise in ROA values from 2009 indicates that the bank's financial performance has been very well over the last 3 years in Kenyan financial industry.

4.2.2 Mobile Banking

Mobile banking has numerous benefits for both customers and banks. As far as the customers are concerned, it provides increased convenience, expanded access and significant time saving. On the other hand, from the banks' perspective, the costs of delivering telephone-based services are substantially lower than those of branch based services. The findings on the number of customers registered in a year are as presented in the table below.

Table 4.2: Mobile Banking (Number of Customers Registered in an Year)

Year	**Number of Customers registered in a year (000') cumulatively.**	
	Mean	Std. Dev.
2008	2016	1537
2009	2218	1690
2010	2440	1859
2011	2683	2045
2012	3220	2454

From the findings, averages for the number of customers registered on the mobile banking service in an year for the commercial banks as extracted from the financial

and annual statements reflects an upward increase over the 5 year period, with the highest being 3.2 million in 2012. In addition, the stardard deviation depict a variation in the number of customers in different commercial banks in Kenya.

4.2.3 Internet Banking

The idea of Internet banking according to Essinger (1999) is: "to give customers access to their bank accounts via a web site and to enable them to enact certain transactions on their account, given compliance with stringent security checks". Presented below is descriptive statistics on the number of transactions in an year.

Table 4.3 Internet Banking (Number of Transactions in an Year)

Year	**Number of transactions in an year (in millions)**	
	Mean	**Std. Dev.**
2008	2.70	0.203
2009	2.70	0.160
2010	2.80	0.148
2011	2.87	0.135
2012	2.97	0.180

From the findings, it can be noted that the internet banking averages for number of transactions in an year (in millions) for the commercial banks rose from 2.70 to 2.97 million. It is also evident that the banks had almost a similar number of transactions as the stardard deviation is so small (less than 1) depicting minimal variability.

4.2.4 Electronic Funds Transfer at Point of Sale Terminals

An Electronic Funds Transfer at the Point of Sale is an on-line system that allows customers to transfer funds instantaneously from their bank accounts to merchant accounts when making purchases (at purchase points). The table below shows descriptive statistics on the number of transactions for the electronic funds transfer at point of sale terminals in a year for the banks.

Table 4.4: Electronic Funds Transfer at Point of Sale Terminals

Year	**Number of transactions in an year (in millions)**	
	Mean	**Std. Dev.**
2008	1597.71	233.39
2009	1079.22	512.90
2010	2113.31	363.96
2011	2736.63	762.30
2012	3473.74	933.27

From the findings, there is variation in the number of transactions for the electronic funds transfer at point of sale terminals in an year for the banks. The average number of transactions was 1.5 million in 2008, which fell to 1.1 million and later rose to 2.1 million before rising to 2.7 and later to 3.4 million in 2012. This variation is also depicted by the stardard deviation.

4.2.5 Branch Networking

Networking of branches is the computerization and inter-connecting of geographically scattered stand-alone bank branches, into one unified system in the form of a Wide

Area Network (WAN) or Enterprise Network (EN); for the creating and sharing of consolidated customer information/records. Table 4.5 summarizes the findings of the number of branch networks implemented in a year.

Table 4.5: Branch Networking (Number of Branch Networks in a Year)

Year		
	Mean	**Std. Dev**
2008	32	1.35
2009	35	3.86
2010	38	4.62
2011	43	8.75
2012	46	4.01

From the findings, there is no much varition in the number of branch networks implemented in an year for the banks. The findings indicate a consistent increase in the averages from 32 in 2008 to 46 in 2012. The stardard deviations also shows minimal variation.

From the annual averages of the thirty banks, it is evident that financial performance increased with increase in number of customers registered in a year; number of transactions in a year; amount transferred or number of transactions in a year as well as number of branch networks implemented in a year. Thus, financial performance of the banks (depicted by ROA) also appeared in tandem with every increase and consequently in a positive relationship with technological innovations.

4.3 Correlation Analysis

The study used Karl Pearson's coefficient of correlation in order to quantify the strength of the relationship between the variables. The Pearson product-moment correlation coefficient determines the strength of a linear association between two variables and is denoted by *r* which can take a range of values from +1 to -1. A value of 0 indicates that there is no association between the two variables. A value greater than 0 indicates a positive association, that is, as the value of one variable increases so does the value of the other variable. A value less than 0 indicates a negative association, that is, as the value of one variable increases the value of the other variable decreases.

The Pearson's coefficient was used to verify the existence or non-existence of linear correlation between and among the technological innovation variables with financial performance. The findings are presented as follows;

Table 4.6: Pearson's Correlation Coefficient Matrix

	Mobile Banking	Internet Banking	Electronic Fund transfer at POS	Branch Networking	Financial Performance
Mobile Banking	1				
Internet Banking	.395**	1			
Electronic Funds Transfer at Point of Sale Terminals	0.13	.381**	1		
Branch Networking	.283**	.318**	.375**	1	
Financial Performance	.350**	.313**	.243*	.309**	1

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

4.3.1 Relationship between the Variables

Results from table 4.6 above reveal that there is a significant positive relationship between Mobile Banking and financial Performance (r = .350**, P-value < 0.01). This implies that Mobile Banking as a technological innovation influences financial performance in Kenyan commercial banks.

The findings also disclosed a significant positive relationship between internet banking and financial Performance (r = .313**, P-value < 0.01). Thus, implying that internet banking as a technological innovation influences financial performance in Kenyan commercial banks.

The findings indicated a significant positive relationship between Electronic Funds Transfer at Point of Sale Terminals and financial Performance (r = .343**, P-value < 0.01) thus, depicting that Electronic Funds Transfer at Point of Sale Terminals as a technological innovation influences financial performance in Kenyan commercial banks.

The results in table 4.6 above indicate that there was a significant positive relationship between mobile banking and Internet banking (r = .395**, P-value < 0.01). A significant positive relationship was observed between Internet Banking and Branch Networking (r = .283**, P-value < 0.01). In addition, there is a significant relationship between Electronic Funds Transfer at Point of Sale Terminals and Branch Networking (3.75**). The findings imply that there is interrelationship in the various technological innovations in the banking industry such a change in one technology affect the other. Since the correlations among the predictive variables was not very

strong there was little evidence of multicollinearity among them and thus all the variables were incorporated into the subsequent regression analysis.

4.4 Regression Analysis

Regression analysis is the statistical technique that identifies the relationship between two or more quantitative variables: a dependent variable, whose value is to be predicted, and an independent or explanatory variable (or variables), about which knowledge is available. The technique is used to find the equation that represents the relationship between the variables. Multiple regressions provide an equation that predicts one variable from two or more independent variables. The study adopted multiple regression guided by the following model:

$Y= \beta 0+ \beta 1X1+\beta 2X2+ \beta 3X3+ \beta 4X4+\varepsilon$

Where:

Y is the dependent variable (financial performance i.e. ROA)

β_0 is the regression constant

$\beta 1$, $\beta 2$, $\beta 3$, $\beta 4$, and $\beta 5$ are the coefficients of independent variables,

X1 is Mobile Banking

X2 is Internet Banking

X3 is Electronic Funds Transfer at Point of Sale Terminals

X4 is Branch Networking

ε is the Error Term.

Table 4.7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.847[a]	.7174	.687	.23655

a. Predictors: Mobile Banking, Internet Banking, Electronic Funds Transfer at Point of Sale Terminals and Branch Networking

In this study, the coefficient of determination (the percentage variation in the dependent variable being explained by the changes in the independent variables) R2 equals 0.7174, that is, Mobile Banking, Internet Banking, Electronic Funds Transfer at Point of Sale Terminals and Branch Networking explain 71.7 percent of the variance in financial performance.

Table 4.8: Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.992	3	.331	6.912	.000[a]
	Residual	1.455	26	.056		
	Total	2.447	29			

a. Predictors: (Constant), Predictors: Mobile Banking, Internet Banking, Electronic Funds Transfer at Point of Sale Terminals and Branch Networking

b. Dependent Variable: Financial Performance

In this case, the significance value of the F statistic is 0.003 indicating that all the predictor variables (Mobile Banking, Internet Banking, Electronic Funds Transfer at Point of Sale Terminals and Branch) explain a variation in financial performance and that the overall model is significant

Table 4.9: Regression Coefficient Results

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.
1	(Constant)	.260	0.046001		5.6521	.000
	Mobile Banking	0.875	0.074601	.254	11.729	.000
	Internet Banking	0.823	0.21784	.300	3.778	.000
	Electronic Funds Transfer at POS	0.551	0.248534	.113	2.217	.000
	Branch Networking	0.670	0.088007	-.167	7.613	.000

a. Dependent Variable: Financial Performance

Table 4.9 presents results of the multivariate regression of tecnological innovations on Financial Performance. From the findings, the coefficients on Financial Performance are positive and significant in all the four variables, indicating that banks have efficient financial performance when technological innovations is efficient interms of mobile banking, internet banking, electronic funds transfer at POS and branch networking. The coefficient on Mobile Banking is 0.875 and is significant. Internet Banking has 0.823, Branch Networking has 0.67 while Electronic Funds Transfer at POS had 0.551

4.5 Discussion of Findings

The objective of the study was to establish the effects of technological innovations on financial performance of commercial banks in Kenya. The objective was assessed by use of secondary data and the subsequent analyses based on the variables of the study. From the findings, in mobile banking as depicted by the number of customers registered on the mobile banking service, had a significant effect on financial performance of the commercial banks. The mean increase in the number of customers from 2016 million in year 2008 to 3220 million in 2010 indicate a growth in mobile banking transactions and consequently improved banks' financial performance. The findings regarding mobile banking are similar to those found in Kenya by Misati, Njoroge, Kamau and Ouma (2010) whose study revealed that mobile banking had expanded the range of services that a bank could offer and hence expanded incomes for banks. Similar findings were shown in a study in Uganda by Porteus (2006) and another one in Tunisia by Mabrouk and Mamogholi (2010) who concluded that mobile banking helped to increase bank incomes and profitability. The study also found a significant positive relationship between Mobile Banking and financial Performance ($r = .350^{**}$, P-value < 0.01). This growth in mobile payments supports the findings of this study and those of other corroborating studies. Mobile banking has experienced high penetration levels in Kenya because it offers an alternative service delivery channel for banks which is both accessible and affordable to many customers. The ease and speed with which customers can transact on mobile phones has made mobile banking very popular to both the banks and the customers.

The study findings revealed that the internet banking averages for number of transactions in an year (in millions) for the commercial banks rose from 2.70 to 2.97

million. It is also evident that the banks had almost a similar number of transactions as the stardard deviation is so small (less than 1) depicting minimal variability. The findings also disclosed a significant positive relationship between internet banking and financial Performance (r = .313**, P-value < 0.01). The findings of this study show that internet banking is used by bank as a convenience platform to enable customers to transact as opposed to it being an avenue for banks to make more revenue. These findings are consistent with previous studies done by Pooja and Singh (2009) and Molhotra and Singh (2009) in India, Simpson (2002) in USA, Sullivian (2000) in USA and Arnaboldi and Claeys (2008) in Finland, Spain, Italy and UK where they all concluded that internet banking improved bank incomes and profitability.

The findings on EFT depicted a variation in the number of transactions for the electronic funds transfer at point of sale terminals in an year for the banks. The average number of transactions was 1.5 million in 2008, which fell to 1.1 million and later rose to 2.1 million before rising to 2.7 and later to 3.4 million in 2012. This variation is also depicted by the stardard deviation. Compared to cheques clearing system, EFT system has the ability to improve the velocity of money within the bank payment system and hence more money is moved within the economy within a short period. This presents an opportunity of banks to make more money. EFT transaction charges are also higher compared cheque clearance charges and hence EFT system is capable of netting in more income for banks.

The findings further indicated a significant positive relationship between Electronic Funds Transfer at Point of Sale Terminals and financial Performance (r = .343**, P-

value < 0.01) thus, depicting that Electronic Funds Transfer at Point of Sale Terminals as a technological innovation influences financial performance in Kenyan commercial banks. These finding corroborate those ones of Sana, Mohammad, Hassan and Momina (2011) in a study done in Pakistan which concluded that electronic banking lead to better incomes for the banks. Agboola (2006) in a study done in Nigeria concluded that EFT not only improved a banks image but also its incomes and subsequently profitability.

The findings showed that there is no much varition in the number of branch networks implemented in an year for the banks. The findings indicate a consistent increase in the averages from 32 in 2008 to 46 in 2012. The stardard deviations also shows minimal variation. This implies that branch networking offers quicker rate of inter-branch transactions as the consequence of distance and time are eliminated. Hence, there is more productivity per time period. Also, with the several networked branches serving the customer populace as one system, there is simulated division of labour among bank branches with its associated positive impact on productivity among the branches. Furthermore, as it curtails customer travel distance to bank branches it offers more time for customers' productive activities. From the annual averages of the thirty banks, it is evident that financial performance increased with increase in number of customers registered in a year; number of transactions in a year; amount transferred or number of transactions in a year as well as number of branch networks implemented in a year. Thus, financial performance of the banks (depicted by ROA) also appeared in tandem with every increase and consequently in a positive relationship with technological innovations. These findings are consistent with a study conducted in India by Pooja and Singh (2009) which concluded that internet usage in

banks led to more income and profits. Dew (2007) also found that internet usage led to more income.

From the findings there was a significant positive relationship between mobile banking and Internet banking; between internet Banking and Branch Networking as well as between Electronic Funds Transfer at Point of Sale Terminals and Branch Networking. The findings imply that there is interrelationship in the various technological innovations in the banking industry such a change in one technology affect the other. This is consistent with studies by Kariuki (2005) who showed the positive impacts of ICT on their banking performance using bank turnover and profits as measure of performance. He established that banks those with high profit growth are more likely to be using greater numbers of advanced ICTs. He concluded that e-banking leads to higher profits though in long-term but not in short-term due to high ICT investment cost. All this studies used profit and turnover as measures of bank performance.

CHAPTER FIVE
SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the data findings on the effects of technological innovations on financial performance of commercial banks in Kenya, the conclusions and recommendations are drawn there to. The chapter is therefore structured into summary of findings, conclusions, recommendations, limitations and area for further research.

5.2 Summary of Findings

The study found out that a steady rise in ROA values from 2009 indicates that the bank's financial performance has been very well over the last 3 years in Kenyan financial industry. Mobile banking as depicted by the number of customers registered on the mobile banking service was found to have a significant effect on financial performance of the commercial banks. A significant positive relationship between Mobile Banking and financial Performance was also established by the study.

The study also disclosed a significant positive relationship between internet banking and financial Performance. Internet banking was found to have improved bank incomes and profitability as it is provided at a minimal charge by many internet service providers and hence making it available as a platform for banks to offer their services. EFT system was found to have the ability to improve the velocity of money within the bank payment system and hence more money is moved within the economy within a short period. This was found to present an opportunity of banks to make more money. EFT transaction charges are also higher compared cheque clearance

charges and hence EFT system is capable of netting in more income for banks. The study as well established a significant positive relationship between Electronic Funds Transfer at Point of Sale Terminals and financial Performance. The study also found out that branch networking offers quicker rate of inter-branch transactions as the consequence of distance and time are eliminated. Hence, there is more productivity per time period. Also, with the several networked branches serving the customer populace as one system, there is simulated division of labour among bank branches with its associated positive impact on performance among the branches.

The study additionally found that there is interrelationship in the various technological innovations in the banking industry such a change in one technology affect the other. From the study it was evident that financial performance increased with increase in number of customers registered in a year; number of transactions in a year; amount transferred or number of transactions in a year as well as number of branch networks implemented in a year.

5.3 Conclusion

Based on the summary of the major findings the following conclusions are drawn:

The adoption of technological innovation has enhanced Kenyan banking industry by making it more productive and effective; Technological innovation also has a strong positive relationship on the overall banking performance by making workers performance more effective and efficient; the adoption of technological innovation has enhanced the fortune of the Kenyan commercial banks.

Customers can have access to their account outside working hours to make withdrawal to attend to their needs; the technological innovation guideline introduced

by CBK strongly helps in effective technological innovation system. Withdrawal can be made anywhere at any time and using any bank ATM machine, customer cannot withdrawal more than some certain amount to allowed other customers have access to cash and money, can be transfer from one place to another through electronic means. In general conclusion the technological innovation has made banking transaction to be easier by bringing services closer to its customers hence improving banking industry performance. It is safe to say that the various banking parameters of performance and profitability have significantly improved in the high technology induction era. From the analysis, the winners emerging would be fully technology oriented banks.

5.4 Recommendations

The banks must be focused in terms of their needs and using the right technology to achieve goals, rather, than acquiring technology because other banks have it. Government participation in ensuring focused telecommunication industry must be visible to reduce or remove avoidable costs of implementing e-commerce and internet banking. Regulatory authorities like Central Bank of Kenya must stipulate standards for the banks to follow to avoid making Kenya Banking Sector a dumping ground for the outdated technological infrastructures.

Training and Manpower development is another major problem militating against the growth of technology innovation in the country. Government must make right IT policy by ensuring that Computer, Communication equipments and other IT infrastructures to a large extent are manufactures in the country so that our people can acquire first hand necessary skills. Government Policy that will guide against Money laundering, fraud and Security risks posed by technology innovation are inevitable.

To counter the legal threat and security posed to net banking and e-commerce, the necessary legal codes backing the industry must be established; this will enhance the growth of the industry.

5.5 Suggestions for Further Research

This study was done only on the commercial banks in Kenya. The study can also be extended to other financial markets such as capital and insurance companies in order to understand the implication of technology innovation on the overall financial markets in Kenya. Similarly the studies can be done for other bank industry in other countries. This study studied was confined to commercial banks yet the current banking innovation such as electronic money is targeted to include the rural marginalized mostly served by micro finance institution in the banking net. There is need therefore to study adoption and use of technology innovation by Micro finance institutions.

There is also need to identify and understand the changes that technology innovation are causing on the banking sector and the payments systems, in order to examine in detail how the recent (and foreseeable) advances in technology innovation are affecting the sector and can affect its future evolution. Therefore a study on the effects of technology innovation on the banking sector and the payments system is recommended.

5.6 Limitations of the Study

This study has several limitations. First, it is possible that the nature of data from the annual statements affected the results in an unanticipated manner or limits the power of the tests to detect associations. This may be created by variation of statistical figures illustrating the key variables measurements.

However, the use of secondary data provided an opportunity to search for a more genuine and intrinsic relationship between the variables. This afforded the researcher the benefits of a greater focus on analyzing the available data more closely in a way that would enhance the achievement of the study objectives.

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APPENDICES

Appendix I

Commercial Banks in Kenya

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

25	Guardian Bank Ltd
26	Gulf African Bank Limited
27	Habib Bank A.G Zurich
28	Habib Bank Ltd.
29	Imperial Bank Ltd
30	I & M Bank Ltd
31	Jamii Bora Bank Limited.
32	Kenya Commercial Bank Ltd
33	K-Rep Bank Ltd
34	Middle East Bank (K) Ltd
35	National Bank of Kenya Ltd
36	NIC Bank Ltd
37	Oriental Commercial Bank Ltd
38	Paramount Universal Bank Ltd
39	Prime Bank Ltd
40	Standard Chartered Bank Kenya Ltd
41	Trans-National Bank Ltd
42	UBA Kenya Bank Limited
43	Victoria Commercial Bank Ltd

Source: Central Bank of Kenya (2013)

Appendix II: Mobile banking (No. of customers registered (in thousands) And Return on assets (%)

	Mobile banking (Number of customers registered (in thousands)					Return on assets (%) ROA				
	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012
African Banking Corporation Ltd.	1250	1375	1513	1664	1997	1.54	1.70	4.64	1.21	1.93
Bank of Africa Kenya Ltd.	1640	1804	1984	2183	2619	1.02	1.14	1.33	1.09	4.70
Bank of Baroda (K) Ltd.	320	352	387	426	511	3.28	3.69	6.15	4.86	4.73
Barclays Bank of Kenya Ltd.	3500	3850	4235	4659	5590	0.87	0.96	1.06	1.71	2.64
Bank of India	2586	2844.6	3129	3442	4130	1.02	1.13	1.24	1.60	2.91
CFC Stanbic Bank Ltd.	1600	1760	1936	2130	2556	1.53	1.52	1.68	1.23	2.20
Charterhouse Bank Ltd	1600	1760	1936	2129	2556	2.32	2.55	3.32	1.95	6.36
Chase Bank (K) Ltd.	801	890	979	1076	1292	2.07	1.17	1.65	0.98	0.00
Citibank N.A Kenya	540	600	660	726	871	2.84	2.68	2.97	3.19	3.85
Commercial Bank of Africa Ltd.	1620	1782	1960	2156	2587	1.49	1.58	0.70	0.87	1.09
Consolidated Bank of Kenya Ltd.	1325	1450	1620	1763	2116	0.65	0.71	0.93	0.95	0.55
Co-operative Bank of Kenya Ltd.	1260	1386	1525	1677	2012	1.82	1.88	2.73	2.47	2.68
Credit Bank Ltd.	2100	2310	2541	2795	3354	4.60	-11.63	-11.63	0.74	-2.34
Development Bank of Kenya Ltd.	2160	2376	2614	2875	3450	3.25	3.58	4.65	5.58	6.14
Diamond Trust Bank Kenya Ltd.	1400	1540	1694	1863	2236	4.12	4.54	5.90	7.08	7.79
Dubai Bank Kenya Ltd.	4750	5225	5748	6322	7587	5.24	5.77	7.50	9.01	9.91
Ecobank Kenya Ltd	1520	1672	1839	2023	2428	6.22	6.85	8.91	10.69	11.76
Equatorial Commercial Bank Ltd.	1260	1386	1525	1677	2012	2.14	2.35	3.06	3.67	4.04
Equity Bank Ltd.	1400	1540	1694	1863	2236	1.34	1.48	1.92	2.31	2.54
Family Bank Limited	1610	1771	1948	2143	2571	1.35	1.49	1.94	2.33	2.56
Fidelity Commercial Bank Ltd	4750	5225	5748	6322	7587	5.34	5.89	7.65	9.18	10.10
Fina Bank Ltd	1650	1815	1997	2196	2635	1.24	1.36	1.77	2.12	2.34
First community Bank Limited	1420	1562	1718	1890	2268	3.66	4.03	5.24	6.29	6.92
Giro Commercial Bank Ltd.	1210	1331	1464	1611	1933	4.36	4.81	6.25	7.50	8.25
Guardian Bank Ltd	1460	1606	1767	1943	2332	5.54	6.10	7.93	9.52	10.47
Gulf African Bank Limited	1670	1837	2021	2223	2667	1.45	1.60	2.08	2.50	2.75
Habib Bank A.G Zurich	456	501.6	552	607	728	2.37	2.61	3.39	4.07	4.48
Habib Bank Ltd.	1610	1771	1948	2143	2571	2.35	2.60	3.37	4.05	4.45
Imperial Bank Ltd	4500	4950	5445	5990	7187	4.56	5.03	6.54	7.85	8.63
I & M Bank Ltd	7500	8250	9075	9983	11979	1.20	1.33	1.72	2.07	2.28
Jamii Bora Bank Limited.	3500	3850	4235	4659	5590	0.87	0.96	1.06	1.71	2.64
Kenya Commercial Bank Ltd	2586	2844.6	3129	3442	4130	1.02	1.13	1.24	1.60	2.91
K-Rep Bank Ltd	1600	1760	1936	2130	2556	1.53	1.52	1.68	1.23	2.20
Middle East Bank (K) Ltd	1260	1386	1525	1677	2012	1.82	1.88	2.73	2.47	2.68
National Bank of Kenya Ltd	2100	2310	2541	2795	3354	4.60	-11.63	-11.63	0.74	-2.34

NIC Bank Ltd	2160	2376	2614	2875	3450	3.25	3.58	4.65	5.58	6.14
Oriental Commercial Bank Ltd	1250	1375	1513	1664	1997	1.54	1.70	4.64	1.21	1.93
Paramount Universal Bank Ltd	1640	1804	1984	2183	2619	1.02	1.14	1.33	1.09	4.70
Prime Bank Ltd	320	352	387	426	511	3.28	3.69	6.15	4.86	4.73
Standard Chartered Bank Kenya Ltd	3500	3850	4235	4659	5590	0.87	0.96	1.06	1.71	2.64
Trans-National Bank Ltd	1600	1760	1936	2130	2556	2.32	2.55	3.32	1.95	6.36
UBA Kenya Bank Limited	801	890	979	1077	1292	2.07	1.17	1.65	0.98	0.00
Victoria Commercial Bank Ltd	540	600	660	726	871	2.84	2.68	2.97	3.19	3.85

Appendix II: Internet Banking and Electronic Funds Transfer at Point of Sale Terminals

	Internet Banking Number of transactions in a Year in million					Electronic Funds Transfer at Point of Sale Terminals Number of transaction in a year (in million)				
	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012
African Banking Corporation Ltd.	1.8018	1.95608	4.8961254	1.4693211	2.1904965	1120	1387	1679	2145	2320
Bank of Africa Kenya Ltd.	1.2825428	1.3963489	1.589598	1.3508851	1.96	1900	1897	2145	2022	2098
Bank of Baroda (K) Ltd.	2.4196983	2.8353139	1.29	2	2.85	1100	1389	1566	2135	2314
Barclays Bank of Kenya Ltd.	1.132215	1.2195365	1.3155902	1.9689303	2.8991013	3400	3768	3599	4589	5643
Bank of India	1.2825401	1.3848941	1.4974835	1.8541734	1.17	1290	1345	1568	1876	1576
CFC Stanbic Bank Ltd.	1.7886015	1.7824341	1.9347775	1.4924097	2.4574068	1986	1137	1233	1874	1187
Charterhouse Bank Ltd	2.5742348	2.8103887	3.5758054	2.2058889	2.6	2490	3560	4067	4144	4600
Chase Bank (K) Ltd.	2.3252937	1.4321983	1.9049894	1.2370817	0.2597732	1459	1546	1673	1582	1987
Citibank N.A Kenya	2.11	2.9406531	3.2264936	3.4471268	2.11	1789	2018	2468	2804	1563
Commercial Bank of Africa Ltd.	1.7452207	1.8363788	0.958593	1.1316968	1.3463065	134	678	679	728	654
Consolidated Bank of Kenya Ltd.	0.9072347	0.9720582	1.1859756	1.2068044	0.808888	346	1089	748	857	786
Co-operative Bank of Kenya Ltd.	2.0836973	2.1341102	2.9920373	2.725791	2.9370808	1123	1890	1245	2156	2309
Credit Bank Ltd.	2.56	1.25	1.38	1.25	2.08	2309	4296	3456	2567	3529
Development Bank of Kenya Ltd.	3.50512	3.8373761	1.91	1.3155902	2.4	1654	2090	1907	1907	1975
Diamond Trust Bank Kenya Ltd.	2.38	2.1	2.16	7.3388347	2.05	1236	1764	1744	1564	6439
Dubai Bank Kenya Ltd.	2.3944284	2.03	2.76	2.26	1.17	8428	8900	9877	9864	9965
Ecobank Kenya Ltd	2.47	2.11	2.17	1.95	1.22	1090	1777	1900	1155	2071
Equatorial Commercial Bank Ltd.	2.3944284	2.6129999	2.32	2.93	2.6129999	2134	2543	2246	2574	2965
Equity Bank Ltd.	1.6018	1.7392421	2.1833147	2.5681777	2.7990954	1678	2107	2155	2044	7559
Family Bank Limited	1.6132	1.7518089	2.1996516	2.587782	2.8206601	13679	29086	13688	15684	16785
Fidelity Commercial Bank Ltd	2.6	2.15	2.91	1.44	1.36	13096	17642	1457	14324	14531
Fina Bank Ltd	1.4944821	1.6209397	2.0295216	2.3836259	2.5960885	3427	5631	4358	4098	4318
First community Bank Limited	2.92	2.29	1.19	1.55	2.18	800	1986	1099	1000	1342
Giro Commercial Bank Ltd.	2.62	5.0681156	1.19	2.5681777	2.51	1133	4214	1357	1864	2318
Guardian Bank Ltd	2.8	2.8	1.19	1.78	1.73	1876	2315	2086	2396	2987
Gulf African Bank Limited	1.712682	1.8614734	2.3422154	2.7588585	2.01	7825	8974	8754	8764	10765

Habib Bank A.G Zurich	2.62754	2.8699716	2.0295216	2.1996516	2.74	1904	2908	2657	2978	1564
Habib Bank Ltd.	2.613084	2.8540359	1.9836262	2.3285515	2.71	1698	2636	2768	2764	1788
Imperial Bank Ltd	2.8	2.29	1.5856356	2.3422154	2.89	11245	12896	13234	13421	14685
I & M Bank Ltd	1.462456	1.5856356	1.9836262	2.3285515	2.5355066	14584	18908	25987	26220	31590
Jamii Bora Bank Limited.	1.132215	1.2195365	1.3155902	1.9689303	2.8991013	3400	3768	3599	4589	5643
Kenya Commercial Bank Ltd	1.2825401	1.3848941	1.4974835	1.8541734	1.17	1290	1345	1568	1876	1576
K-Rep Bank Ltd	1.7886015	1.7824341	1.9347775	1.4924097	2.4574068	1986	1137	1233	1874	1187
Middle East Bank (K) Ltd	2.0836973	2.1341102	2.9920373	2.725791	2.9370808	1123	1890	1245	2156	2309
National Bank of Kenya Ltd	2.56	1.25	1.38	1.25	2.08	2309	4296	3456	2567	3529
NIC Bank Ltd	3.50512	3.8373761	1.91	1.3155902	2.4	1654	2090	1907	1907	1975
Oriental Commercial Bank Ltd	1.8018	1.95608	4.8961254	1.4693211	2.1904965	1120	1387	1679	2145	2320
Paramount Universal Bank Ltd	1.2825428	1.3963489	1.589598	1.3508851	1.96	1900	1897	2145	2022	2098
Prime Bank Ltd	2.4196983	2.8353139	1.29	2	2.85	1100	1389	1566	2135	2314
Standard Chartered Bank Kenya Ltd	1.132215	1.2195365	1.3155902	1.9689303	2.8991013	3400	3768	3599	4589	5643
Trans-National Bank Ltd	2.5742348	2.8103887	3.5758054	2.2058889	2.6	2490	3560	4067	4144	4600
UBA Kenya Bank Limited	2.3252937	1.4321983	1.9049894	1.2370817	0.2597732	1459	1546	1673	1582	1987
Victoria Commercial Bank Ltd	2.11	2.9406531	3.2264936	3.4471268	2.11	1789	2018	2468	2804	1563

Appendix III: Branch Networking (Number of branch Networks in an year)

	Branch Net work				
	2008	2009	2010	2011	2012
African Banking Corporation Ltd.	7	8	8	9	10
Bank of Africa Kenya Ltd.	12	13	15	16	18
Bank of Baroda (K) Ltd.	9	10	11	12	13
Barclays Bank of Kenya Ltd.	67	74	81	89	98
Bank of India	27	30	33	36	40
CFC Stanbic Bank Ltd.	17	19	21	23	25
Charterhouse Bank Ltd	52	57	63	69	76
Chase Bank (K) Ltd.	27	30	33	36	40
Citibank N.A Kenya	53	58	64	71	78
Commercial Bank of Africa Ltd.	14	15	17	19	20
Consolidated Bank of Kenya Ltd.	52	57	63	69	76
Co-operative Bank of Kenya Ltd.	25	28	30	33	37
Credit Bank Ltd.	19	21	23	25	28
Development Bank of Kenya Ltd.	44	48	53	58	64
Diamond Trust Bank Kenya Ltd.	8	13	10	16	19
Dubai Bank Kenya Ltd.	24	26	29	32	35
Ecobank Kenya Ltd	47	51	56	62	68
Equatorial Commercial Bank Ltd.	26	29	31	35	38
Equity Bank Ltd.	47	51	56	62	68
Family Bank Limited	30	33	36	40	44
Fidelity Commercial Bank Ltd	4	4	5	5	6
Fina Bank Ltd	6	6	7	7	6
First community Bank Limited	42	46	51	56	61
Giro Commercial Bank Ltd.	41	45	50	55	60
Guardian Bank Ltd	57	63	69	76	83
Gulf African Bank Limited	67	74	81	89	98
Habib Bank A.G Zurich	45	50	54	60	66
Habib Bank Ltd.	47	51	56	62	68
Imperial Bank Ltd	46	51	56	61	67
I & M Bank Ltd	6	7	7	8	9
Jamii Bora Bank Limited.	70	77	85	93	102
Kenya Commercial Bank Ltd	75	83	91	100	110
K-Rep Bank Ltd	67	74	81	89	98
Middle East Bank (K) Ltd	2	2	2	3	3
National Bank of Kenya Ltd	51	56	62	68	75
NIC Bank Ltd	44	48	53	58	64
Oriental Commercial Bank Ltd	13	14	16	17	19
Paramount Universal Bank Ltd	5	8	9	10	12
Prime Bank Ltd	21	23	25	28	31
Standard Chartered Bank Kenya Ltd	19	21	23	25	28
Trans-National Bank Ltd	10	11	12	13	15

UBA Kenya Bank Limited	8	9	10	11	12
Victoria Commercial Bank Ltd	7	8	8	9	10