

**TECHNOLOGICAL INNOVATION AND PERFORMANCE OF  
COMMERCIAL BANKS IN KENYA**

**BY**

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## **DECLARATION**

I wish to declare that this research project has solely done by myself and has not been submitted for any award in this university or any other institution; neither has part of this work been reproduced, reprinted or made available to other groups in any form. The research work should not be used without permission from the researcher or the university.

Sign\_\_\_\_\_

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D61/5992/2017

This research project has been submitted for examination with my approval as the university supervisor.

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## **DEDICATION**

I dedicate this research project to my lovely husband Francis Waweru, my children; Gift Njoroge and Jeremy Fadhili; for their moral support as I worked on this study.

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## **ABBREVIATIONS & ACRONYMS**

ATMs:	Automated Teller Machines
CBK:	Central Bank of Kenya
EFT:	Electronic Money Transfer
IT:	Information Technology
KBA:	Kenya Bankers' Association
KSHS:	Kenya Shillings
RTGS:	Real Time Gross Settlement
USA:	United states of America

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## **ABSTRACT**

This study sought to examine the technological innovation and performance of commercial banks in Kenya. In particular, the study sought to: investigate the extent to which technology innovation has been adopted by commercial banks in Kenya, to determine the technological innovation challenges faced by commercial banks in Kenya and to establish the relationship between technological innovation and performance of commercial banks in Kenya. Three theories were used by the study and these include Diffusion of Innovation Theory (DOI), Disruptive Innovation Theory (DOT) and Actor Network Theory (ANT). A census was undertaken where 2 managers, operations and information technology managers are from all the 42 commercial banks selected for the study making it 84 respondents. The study used structured questionnaire as data collection instruments for getting primary quantitative data from the chosen study participants. This study used descriptive statistics and regression analysis in analyzing data. The findings show that majority of the respondents were male with most of them being employees of the lower management level. The study achieved a response rate of 93% and the study indicates commercial banks had adopted technological innovation as shown by R-square 0.6782 (68%) and P-value of 0.00429 and hence there is positive influence on performance of commercial banks. The study reports that lack of expertise to handle regularly requirements was rated as some of the challenges facing banks with mean of 3.78. Based on data analyzed, this study concludes that innovation is important for customers in the banking sector because it is often utilized as an instrument to increase and simplify operations in the commercial banking sector. Commercial banks should therefore invest in maximization of the return benefits realized from digital platforms such as mobile and internet banking.

# CHAPTER ONE: INTRODUCTION

## 1.1 Background of the Study

While competitions continue to become increasingly global and strong and many markets witness rapid change driven by continue development of technologies and advanced customer expectation; maintaining intense competition in organizations is an adverse environmental experience that has proven to be a challenge without investment in innovation-related potentials. Laeven, Levine, and Michalopoulos (2015) points out that innovation is presently seen as the means through which organizations respond better to the transformations that place in the business environment in the 21<sup>st</sup> century. As a result, innovative firms are able to understand and pursue its customer needs through the development of new products that can address such identified needs and develop and implement internal processes and activities that promote knowledge and fulfillment of customer needs (Parameswar, Dhir & Dhir, 2017).

There have been several attempts in recent studies that describe and define what is meant by innovation and this topic continue to attract attention of scholars and practitioners. Accordingly, they range from defining innovation as a source of viable gain that allows the firm to process and new operating philosophy adopted by firms in the 21<sup>st</sup> century. To be specific, innovation according to Hurley and Hult (1998) represents the capacity to ensure new products process or new structure is introduced in the organization. Similarly, innovation can be regarded as comprising three clearly distinct phases and that is innovation as process, mirrored in discrete objects such as product or services and generally innovations as the characteristics of organization (Baregheh, Rowley & Sambrook, 2009). According to West and Anderson (1996) innovation is the effective improvements and application of process and products that are new to the firm designed to promote value that is delivered to the stakeholders.

According to Weigelt and Sarkar, (2012) numerous studies on innovation have concentrated on how innovations are communicated over a period of time to the stakeholders of specific institutions. They reviewed 2400 innovation reports that were gathered from various publications. Their findings show that only 17% focused on how innovations were used in a firm although in most instances, each member adopted innovation only

when other firms had used these innovations. Notably, innovations can be adopted to enhance performances or remove performance gaps that resulting from changes in external environments such as change in demand of output of the firm. Therefore, a firm can adapt to the difference in the environment through adoption of administrative and technical innovation in order to change the social or technical systems. As banking industry continue to witness increasing innovations in recent times, the notable recent innovations in the financial institutions is Pesalink.

### **1.1.1 Technological Innovation: Pesalink**

As argued by Alegre, Lapiedra and Chiva (2005), innovation is an important aspect for any business success and Ngugi and Karina (2013) describes it as the implementations of creative ideas within the firm successfully. For Okiro and Ndungu (2013), innovation is defined as ideas, objects and practices that are perceived by new staff or stakeholders in the organization. In this study, innovation is described as technological innovation taking place in Kenya's financial sector, in particular, Pesalink in which it has enhanced banking services. Brige (2006) argued that without adoption of technology, many commercial banks are likely to fail in providing customers with effective services, but also any shorter banking history can increase the danger of such a reduced customer loyalty towards the service supplier.

Pesalink is an initiative of the Kenya Bankers Association (KBA), the umbrella organization of the banks that is licensed and supervised by Central Bank of Kenya (CBK), with a current membership of 47 financial institutions. KBA reported that its members were losing about ksh2.2 billion (US\$22 million annually in commissions to mobile money transfer providers to telecommunication companies through mobile money transfer services, mostly Safaricom's MPESA platform (Olaka, 2017). Pesalink aims at creating an interbank mechanism that enables interoperability across KBA's members for all retail payment streams. Banks have been accused for taking a conservative approach when it comes to adopting latest technologies, disruptors such as fintech companies on the other hand moved fast. In 2012, prior to their entry, the fastest method customers could transfer money to another bank was to withdraw cash from their bank account, travel to the beneficiary bank and make a deposit. Pesalink facilitates real-time cash transfer between banks without going through mobile phone banking platform.

Through this platform, customer demands are responded to, commitment to delivering an advanced solution that can handle bank customer transactions around the clock.

Unlike mobile money transfer service providers that have a daily transfer cap of ksh70,000 per transaction and a maximum of Kshs140,000 per day, Pesalink allows users to transact as low as Ksh10 and maximum of one million shillings. Pesalink is free to clients transferring Kshs10 to Kshs500. The charges are more affordable compared to what the mobile money transfer providers are offering. This is because banks use a shared infrastructure and this means the benefits are passed to consumers (Olaka, 2017). However, money transfer technology comes with some challenges especially within the banking sector. It has been recognized that advances in financial technology have failed to reduce intermediation costs. While commercial banks become less likely to adopt the new technology immediately because of available regulatory policies and often rely on old IT infrastructure, these innovations expected to benefit the banks more. Another challenge facing the money transfer is security, which has become the main concern among customers and any stakeholders due to mobile phone payment apps, the credit cards store, as well as any available financial information to make payments very easy and seamless for a buyer and a customer can be afraid of their security.

It is important to recognize that many customers in the financial sector have been using to their usual payment methods which have been there for long and as such cash continue to be within their comfort zones and any new payment method or a change in their ay of payment can be meaningless for them (de Reuver, et al, 2015). In addition, many developing countries experience Internet connection speeds such, as poor network coverage. Consequently, all of these tend to drive the ever-rising demand for the transformation of digital and mobile payment technology.

### **1.1.2 Performance of Firms**

The performance of a firm is often measured using three variables (efficiency, effectiveness and productivity that are very important for any firm. Based on system perspective, performance is the ability of an organization to adapt with essential systemic processes including input, the output, transformation and feedback effects that are relative to the firm's goal seeking behavior (Weigelt & Sarkar, 2012). Moreover, Al-Khalil, Dahiyat & Al-dalahmeh (2014) maintains that a firm that performs better can

achieve its main activities effectively and can carry out its firm-maintaining and firm-adapting roles effectively. In this case, firm-adapting roles require that based on changes in environment, the structure or process of any firm should undergo change in order to meet the new environmental conditions. Consequently, any firm that is innovative are likely to do more and they not only adapt to the changes in the environment but also utilize its resources and skills in creating new environmental conditions such as introducing new products that had not entered into the market previously. An innovation is the provision of these external or internal changes and therefore these are the means of maintaining or enhancing performance of the firm. Al-Khalil, Dahiyat, and Al-dalahmeh (2014) observes that commercial banks that can be very effective and expert innovators in goods tend to use the system for banks in a different manner and are in a position to handle the activities of coming up with new products available in the market compared to less innovators in the banking sector.

As customer satisfaction becomes more antecedent in the debate on financial performance, an important question that confront many is that, is it not a performance in itself as well? This is dependent on how firm performance is defined and as such defining firm performance as stakeholder satisfaction can help in differentiating between antecedents and performance outcomes. Therefore, customer satisfaction can also be said to be an outcome and hence part of the firm. In other cases, stakeholder satisfaction has been used in measuring firm performance mainly in financial performance – profitability, growth and market value help to assess how the firm has performed.

### **1.1.3 Commercial Banks in Kenya**

The financial industry in Kenya is considered one of the progressing because it plays a crucial role in the country's economy and has a total of 43 banks. Out of the total banks, 42 are commercial banks while only one is a mortgage agency (CBK, 2018). Further reports by CBK shows that 40 banks are privately owned with the government having majority shareholding in 3 banks. In addition, out of the 40 banks owned by private individuals or organization, 25 are owned locally while 15 are owned by foreign individuals and organizations.

The banks in Kenya are divided to three categories using a weight composite index (CI) that is determined by customer deposits, net assets, capital and reserves, number of

deposits held by banks and number of loan amount. into three groups using weighted CI based on deposits for customers, and the number of loan accounts. In this categorization, any commercial bank with weighted CI of 5% or more, it is regarded as big banks while medium banks are given weight composite of 1% or less.

## **1.2 Research Problem**

Technological innovation is often viewed as the main survival and success across many organizations. As whether it is intended for use internally or external, adoption decisions have to consider responses of the final user for such technological alternatives. In a study, Ongonga and Ochieng (2013) found that improvement in bank performance is linked to technological innovation that tend to solve and accommodate the uncertainties facing firms in their environment. It be noted that the above study looked at innovation in general, while this research will focus on Pesalink.

Studies conducted in Kenya reveal that banking sector faces numerous challenges because of under-capitalization, many cases of Non-Performing Loans (NFLs) and weak institutional governance (Mbogoh & Ogutu, 2017). As noted by Goulet and David (1996), banking sector will continue to experience dramatic change over a short period from being virtual to highly competitive market. As financial transactions volumes and complexity of market participant increases, certain frictions emerge and thus increase costs and risks of transactions in financial market (Mazzucato & Penna, 2016). These financial and operational inefficiencies have prompted commercial banks to seek solutions. As a result, availability of technology has become very important factor in determining extent which technology has reduced such inefficiencies. For example, emergence of Mpesa and Real Time Gross Settlement (RTGS) system has transformed the financial sector as customers transact based on their flexibility. In short, many commercial banks have introduced new technologies that enable delivery opportunities and products such as the mobile banking, electronic banking and agency networks that offer customer different services.

In recent years, few financial institutions that collapsed failed because of NPLs or the resistance to emerging technological change. A report by the Central (2016) shows that the collapse of Imperial Bank, Dubai Bank and Chase Bank reveals that their managers

failed to conduct assessment of bank's risks or had not dealt with it properly. Adoption of technological innovation can pose some problems to banks including operational challenges arising from financial fraud, processing errors, disruptions of systems or any other events that are unanticipated which can lead to inability of the firm to deliver products or services (Tarhini, Mgemenas, Trabs and Masadeh, 2015). Moreover, the challenges experienced by banks are system failures, software detects, capacity inadequacies and inadequate recovery capabilities. Therefore, these issues are likely to affect the commercial bank's performance and also reputation risk that results in a critical loss of customers.

Several studies have been carried out on the adoption of technologies used in the banking sector in Kenya (Aduda & Kingoo, 2012; Lilly & Juma, 2014; Njihia & Mwirigi, 2014). For example, Aduda & Kingoo (2012) carried out a study on the relationships amongst the e-banking and performance of commercial banks in Kenya. The authors used secondary data found in annual reports of the selected commercial banks and also CBK. In other studies, Lilly & Juma (2014) investigated the influence of strategic innovations against performances of banks in Kenya and using case study; they selected a sample of 119 study participants out of the selected 170 managers in Nairobi County branches of Kenya Commercial Bank. The authors found that costs management elements of strategic innovations, sustained improvements in quality, provision of innovative strategies and the innovative marketing actions influenced positively the performance of commercial banks.

In addition, Njihia & Mwirigi (2014) in a study conducted in Kenya examined the effects of enterprise resource planning systems on performance of banks in Kenya. Their research adopted a descriptive design with questionnaires as the data collection tools. While the above studies have examined effect of technology or technological innovation on performance of commercial banks, Pesalink as a technological innovation that allows real time cash transfer between banks without going through mobile money platform has not been well articulated. Therefore, this research will fill this knowledge gap by attempting to answer the following research objective question: How has the adoption of Pesalink in Kenya affected performance of banks?



### **1.3 Research Objectives**

- i. To investigate the extent to which technology innovation has been adopted by commercial banks in Kenya.
- ii. To determine the technological innovation challenges faced by commercial banks in Kenya.
- iii. To establish the relationship between technological innovation and performance of commercial banks in Kenya.

### **1.4 Value of the study**

Technological advancements have been intensely and certainly associated with firm performance in most economies. The results from this research will play an important as it will be used by following stakeholders. The findings will provide the commercial banks in Kenya with useful information that helps in broadening understanding on the influence of adopting Pesalink innovations as introduced by Kenya Bankers Association (KBA). Importantly, the information produced by the study will be very essential for strategic decisions for many firms. In addition, policy makers will use the findings of the empirical findings creating an enabling environment for implementation of new technology.

## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

The chapter is divided into four sections. First, the chapter discusses technological innovation in the banking sector, challenges of technology among banks. The chapter also discussed conceptual framework showing the relationship between Pesalink and performance and lastly the chapter concludes with the summary of literature review on in other summary of the chapter.

### **2.2 Theoretical Foundation**

In the examination of adoption of Pesalink and performances of banks, this study used three theories – Diffusion of innovation theory, disruptive innovation theory and actor network theory.

#### **2.2.1 Diffusion of Innovation Theory (DOI)**

This theory was developed or advanced by an American Communication theorist and sociologist, Everett Rogers in 1962, explains how, why and the rate at which products, services, or even processes tend to spread so fast in the society or among large population (Simpson & Clifton, 2017). DOI has been used mainly to explain adoption of new technologies across countries and for Everett Consequently, this theory explains that people or firms can adopt newer ideas, behaviors or even products in the market. Baptista and Oliverta (2015) describe adoption as a process where most people or firm do certain things in a different manner or ways compared to their past performance.

Everett Rogers recommended four key elements that can impact the spread of any new idea and these includes innovative itself, communication channels, time and social system. According to the theory when banks adopt Internet banking or any other technological related product, they enjoy cost advantage if they adopt it early and hence increase their size relative to non-adopters (Brinton, Khavul, Siegel & Wright, 2015). This theory explains user adoption of different innovation in the target populations. DOI has widely been used by scholars studying banking sector especially Internet and related technology adoption. Rogers argues that diffusion patterns varies significantly

across banks and observed that large banks appear to have advantage adopting innovation than the smaller ones. The Diffusion of innovation theory has been chosen for the present because it explains why commercial banks adopt technology such as Pesalink. In short banks, which adopt technology innovations, appear to performing better than those that are not innovative.

### **2.2.2 Disruptive Innovation Theory (DOT)**

This theory is most leading theories in innovation that was popularized by Clayton Christensen, from Harvard Business School. Christensen (1997) in his book, “The Innovator’s Dilemma” explained the failure of respected and well-managed firms. He argued that good managers face dilemma because they do the things they intend, to succeed – invest in business, built distinctive capabilities. King and Baatartogtokh (2015) argues that DOT has proven to be powerful way of explaining about innovation driven growth across firms. According to the business, environment of bigger organization cannot allow them to pursue disruptive innovations when it arises because they are not at first profitable adequately and their developments can take scarce resources far from sustaining innovations.

DOT proposed that every market improvement which customers utilizes or absorbs, there is trade trajectory of improvement that innovating firms provide as they introduce new and improved product and lastly a sustaining innovation target that demands high and customers with better performance compared with what was there earlier. According to Rayner (2014) incumbent are needed to succeed but managers fail to employ them effectively to prevent disruption. Most scholars consider this theory an important means used to develop and broaden emerging markets. DOT has been chosen for this study because it explains types of technological innovation adopted by commercial banks. It also explains how commercial banks can utilize technology to get to customers at the lower levels of the market access point for a product or service initially accessed with customers with more financial power or who were more skilled.

### **2.2.3 Actor Network Theory (ANT)**

The theory is associated with Michael Callon, Bruno Latour and others including John Law who popularized it in early 1980 at the Centre de Sociologie de l’innovation (CSI) (Shim & Shin, 2016). The core of ANT is translation defined as a means by which an

entity gives a role to others (Singleton & Michel, 1993). Based on this theory, it is important to focus on the technological perspectives of innovations and tend to treat social as the framework in which its development and innovation take place. This theory puts into consideration both social and technical factors as flawed and instead proposes socio-technical account (Rydin & Tate, 2016).

According to Sayes (2014) as a result of ANT, technology has been hypothesized as fluids, an interactive process and the symbolic meanings attaching to it as being negotiation and reinvention that is continuous. ANT attempts to explain strategies used to relate different elements together into a network to perform business operations. The networks are transient and exists in a constant making and remaking meaning relations should be performed repeatedly. This study uses ANT because it offers an understanding in social and technical elements that explains the adoption of technology among commercial banks.

### **2.3 Technological Innovation in Banking Sector**

Although many types of innovations have been identified in the recent literature, scholars have not agreed on the conflicting theoretical projections about the implications arising from adoption of innovation types. Some of the main issues are a firm's cumulative streams of technological projects that have some affinity to the new technology (Nanda, & Nicholas, 2014; Cirera, & Maloney, 2017). Studies have shown that banks adopt technological innovation in search of competitive edge in a dynamic and sometimes hostile environment (Paramesnar, Dhir & Dhir, 2017; Mugane & Odingo, 2016). Consequently, most banks are introducing new products, and service to retain highly valued customers and subsequently position themselves for future market. However, while such trends continue, nature of risks exposed by technology continues to change and these changes poses many challenges to the banks (Romanova & Kudiska, 2016).

Innovation has been described as a items that is new to developers as users (Pydin& Tate, 2016). On the one hand, innovation for Mazzucato, and Penna (2016) is on important function of technology creativity and sees innovation as research technology and creativity. One of the notable examples of technological change that has reshaped financial industry is the continued shift from relying on human analysis to automated

analysis, for example loan applications especially retail is today evaluated using credit scoring tools-computer generated. Therefore, such automation approach eliminates the need to have a customer present themselves to make loan application (Abbas, Hassan, Asif, Funaid & Zainab, 2018). Consequently, this automation also reduces underwriting and compliance costs for lenders. While such trends continue, the nature and size of risks that are posed by the technological innovation continue to change and the changes poses more challenges for commercial banks and management.

In Kenya, banks have for the past years have invested in Technology to enhance quality and security of their products and services. Some of the banking initiatives aimed at enhancing efficiency through technology that commercial banks invested in are emergence of mobile banking in Kenya, which has substantially caused disruption. Kenya bankers Association (KBA) (2015) report that many commercials have reduced revenue loss after adoption of technology. The consistent operations of the mobile banking have proved to be faster. Another technological innovation that has attracted research is ATM point of sale.

Studies have shown that mobile banking is easier compared to normal banking services. The emergence of this mode of banking was certainly associated with time saving, flexibility of access, physical security and partly saves costs (Lankkanen, 2016; Kikulwe, Fischer & Qaim, 2014). However, inability on the part of customers from exploiting the technological advancement (ATM, mobile banks) is attributed to inadequate knowledge on what ATM on other technology does, failure by commercial banks to offered diversified services (Lankanen, 2016). In another study by Khan (2010) examined ATMS service quality and customer satisfaction among banks.

Although there exists a large academic literature on technological innovation among banks, others have such literature on Pesalink. Many of the available in Kenya have focused on mobile banking (Mpesa) (Burns 2015; Juma, Murwa & Rabah, 2018). The present study examines if adoption of Pesalink has enhanced performance of commercial banks. Many economists argued that emergence of such technological changes in the financial market have promoted a unified payment infrastructure with access to the bank and unbanked customers (Rashid, 2018). However, Pesalink while sending to a phone number is only limited to registered members though even those who have not

registered a phone number can receive if the sender inputs an account number rather than a phone number which according to Cook and Mckay (2017) Pesalink had two million registered users, in the 20 member commercial banks by May 2017.

Development in electronic systems is witnessed as geared toward emergence of electronic payment process and electronic banking (Ghos, et al, 2016). In particular, in technological description, payments are information transfers that credit and debit accounts. In today's society, electronic payment instructions are accompanied by information transfers which involves additional information exchange that accompany credit and debit instructions. In most countries, Internet banking has continued to be widespread in a very short period, despite existence of differences among banks in the implementation. In a study conducted in USA, Bezovki (2016) reported that nearly 40% of banks offered informational websites. Other studies have examined performances of banks offering Internet services and found banks offering transactional services were more profitable. In general technologies innovation increases profitability through enhancing revenue collection or lowering costs.

Internet banking is provided by commercial banks for people to find out information their accounts held in the banks, be able to pay their bills among others through the Internet. The Internet banking can allow customers to transact online rather than visit the bank to find it and talk to customer one. The ATM payment method is widely adopted through electronic ways by commercial banks and it is operated through plastic card with some special features. A computer, which allows many customers perform financial withdrawals, controls the system and also customers are able to check balance without coming into contact with banking officials or cashiers.

Real Time Gross Settlement is an electronic form used to transfer funds in which the transmissions take place on a real-time basis. The real time is defined as a process where instructions are implemented as they are received, instead of performing it at a later date.

### **2.3.1 Technological Innovation and Performance**

Many firms make strategic decisions in competitive business settings where deployment of technology is very important in maintaining levels of competitiveness (Reymen, Berends, Outehand & Stulteins, 2017; Khan, 2010). Moreover, the superior the firm's technologies capability, the more the firm can enhance performances. Therefore technological innovation is a strategic mechanism that can improve cooperation, communication and information and knowledge exchange through appropriate channels that encourage its flow more rapidly throughout the organization firms that invest in technology to support exchange of knowledge amongst its key stakeholders contributing to greater performance from the team and the organization realizes its absorptive capacity because firms encourage exploitation of knowledge (Rico, Sanchez-Manzanares, Gil, & Gibson, 2008; Chanyi, 2015).

Previous research on how technological innovation has affected banking activities. For example, Gerstenfield and Wertel (2007) investigated the relationship that exists between the use of technological innovation and types of innovation and financial performance of banks. They used a sample of 7302 financial institutions in Europe. They found that internet-based technological innovation is an important enabler. In India, Arora, and Sandhu (2018) examined factors that influence customer's usage of electronic banking services. They used data collected from bank customers on their perception on, e-banking and other demographics.

In Kenya Ndunge, Njati and Rukangu (2016) conducted a research to examine the influence of technological innovation of bank performance in Meru town. They used descriptive research design and a sample of 60 bank employees (especially bank managers). Their findings show that at 80%, the performance of bank is affected by technological innovation They concluded that adoption of technological innovation among commercial banks in Meru town enhanced their financial performance. However, their main target was on banks managers and hence the findings could not be generalized to include customers as they were missing as key technology users.

### **2.3.2 Technological Innovation Challenges in the Banking Sector**

The rise of technology has made customers become connected and this has led to ever rising relationship between the bank and their customers making banks embed themselves in customer's lives to meet their expectation. However, studies have reported that banks continue to face problems in using technology (Berzin, singer & Chan, 2015). Financial technology firms are reported to have utilized technology in providing simplified usage, suitable and cost-effective products and services to customers.

Studies conducted in India, shows that technological-based services in the banking industry failed due to socio-economic, legal, technological legal and infrastructural factors (Mohanty, 2011). Smith, Fresseli and Thomas (2014) states that, the slow pace of popularity in technology use by banks are due to lack of early mass adoption of technology, shown in internet adoption by the older generation and lack of security and trust in technology tools in the banking industry. In Malaysia, Rahi, and Abd.Ghani (2018) examined the perceived security of technology and the game aspects within the electronic banking and the data used were collected from a sample 398 customers of commercial banks, using convenience-sampling technique.

Although banks invest heavily on new design of delivery channels, some others factors require attention. For example, understanding the underlying customer attitudes, their present transaction behavior and inadequate scientific research to design tactics to change customer behavior (Das, Verburg, Verbrack, Bonebakker, 2018). Despite advances made in technological innovating commercial banks today keeping up records to Provide exchange inside their system. However, while progress is made to decrease intricacies made and back offer capacities continue to be moderate and wasteful with electronic exchange taking long to settle and accommodate.

Technological innovations among commercial banks are facing challenges of weak infrastructure. According to a report by International Finance Corporation (IFC) (2017) while regulation in some countries have created an environment that is favorable to financial products and services, much work remains to be done in many countries. In cases where financial infrastructure in missing, the network of the bank retains significant value. Moreover, the increased competition that is generated by technological innovation complicates how established banks increases it profits the larger banks in most



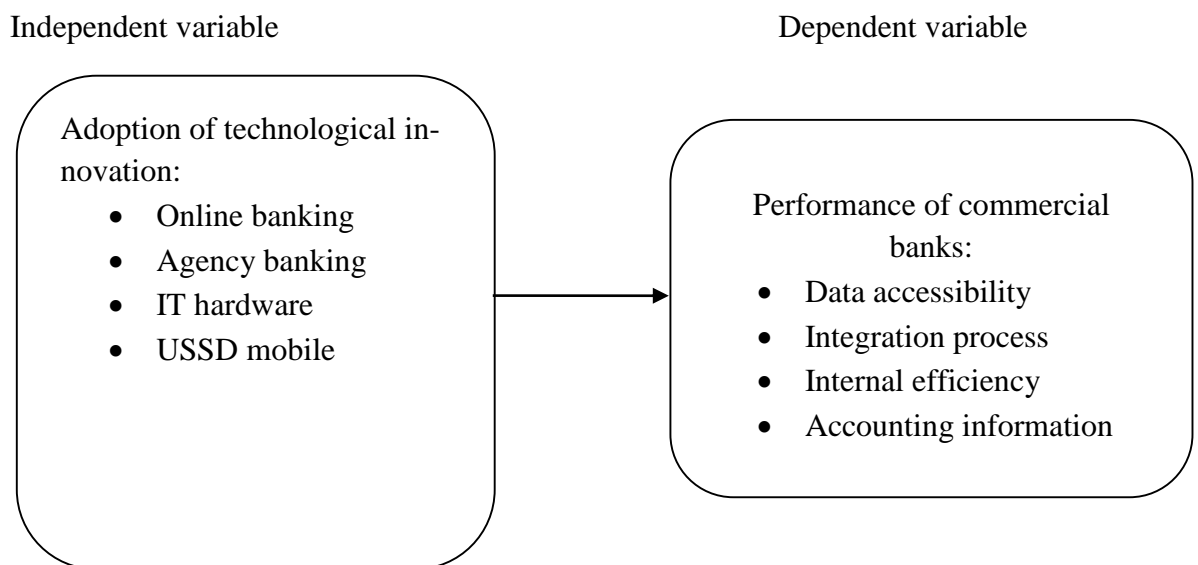
countries are aware of potential threat from new technologies on their business models and strategies (Martins, Oliveira & Popovic, 2014).

Literature also shows that, the implementation of new technologies increases operational risks and it becomes a challenge for established banks to implement IT Systems (Ford, 2018) for example emergence of Fintech carries risks such as cyber security. There are also operational risks in outsourcing parts of a value chain to new entrants. It is also argued that technological innovation can force commercial banks to modify their operating systems and earning models. The banks in doing its several business activities such as payment services, lending and investments if any; banks do not adopt innovation as soon as possible, it puts Pressure on their business models. As such fragmentation of value chain and loss of customer contact suggests the banks are unlikely to take advantage of cross selling (Malik, 2014).

## 2.4 Conceptual Framework

Assumption is that Pesalink has influence on performance. In summary, this model provides a reference to enhance an understanding of Pesalink and commercial banks performance as presented in figure 2.1.

**Figure 2.1: Conceptual Model**



**Source: Researcher 2019**

## **2.5 Summary of the chapter**

Although commercial banks in Kenya are mostly affected by technological innovations, few of the available studies have examined the effects of technological innovation on performance of commercial banks. Only few researchers have studied the impact of technological innovations on performance of financial institutions in Kenya focusing on senior management in Kenya. In across many nations, the banking industry is characterized by high involvement in innovation.

## **CHAPTER THREE: METHODOLOGY**

### **3.1 Introduction**

This chapter discusses the methodology used and further provide the conceptual framework. The chapter also provides details of research design, the target population, sample data collection tools, reliability and validity of collection and analysis of data as well as ethical considerations.

### **3.2 Research Design**

Research design is a blueprint, organization and approach adopted in conducting an investigation in order to obtain responses to a research questions and be able to control the variations. In addition, a research design is a plan of action adopted by a researcher in answering the study questions and sets the framework for the research (Kerlinger, 1973). The present study used descriptive research design, which Orodho (2003) is a method used to collect information using interviewing or administration of a questionnaire.

### **3.3 Target Population**

This study targeted a total of 84 managers working in 42 commercial banks that are registered and supervised by CBK located and operated in Nairobi County between 2014 – 2018 (Appendix 1). A census was undertaken where 2 managers, operations and information technology managers are from all the 42 commercial banks selected to provide the required information.

### **3.4 Data Collection**

The study used structured questionnaire as data collection tool. Questionnaire has been selected by the study because it can reach a wider coverage of large geographical area within the shortest time, is able to provide respondents with adequate time answer the questions, offer security or confidentiality to those answering the questions and viewed an objective tool because there are no biases that can be attributed to personal characteristics. The target respondents were the middle level managers who interact directly with Pesalink. The researcher gave 1 questionnaire to each respondent in the 42 banks.

### 3.5 Data Analysis and Presentations

Descriptive and regression analysis was used in the study. In this research project, quantitative data extracted from the questionnaires were coded and thereafter analyzed with the use of Statistical Package for the Social Sciences (SPSS). Results will be presented using frequency and percentages. Qualitative data, on the one hand, will be grouped according to the thematic areas guided by the objectives and findings presented in narrative form. Descriptive statistics was used in analyzing objective (i) and (ii) while on the other hand, regression model was used to analyze objective (iii) as shown below.

$$Y = a_0 + a_1X_1 + a_2X_2 + e$$

Whereby

Y = Performance of commercial Banks

X<sub>1</sub> = Technology innovation-Pesalink

X<sub>2</sub> = Characteristics of the Bank

a<sub>0</sub> = Constant value

a<sub>1</sub> a<sub>2</sub> are coefficients

e = standard error of the estimate

## **CHAPTER FOUR: DATA ANALYSIS AND PRESENTATION OF RESULTS**

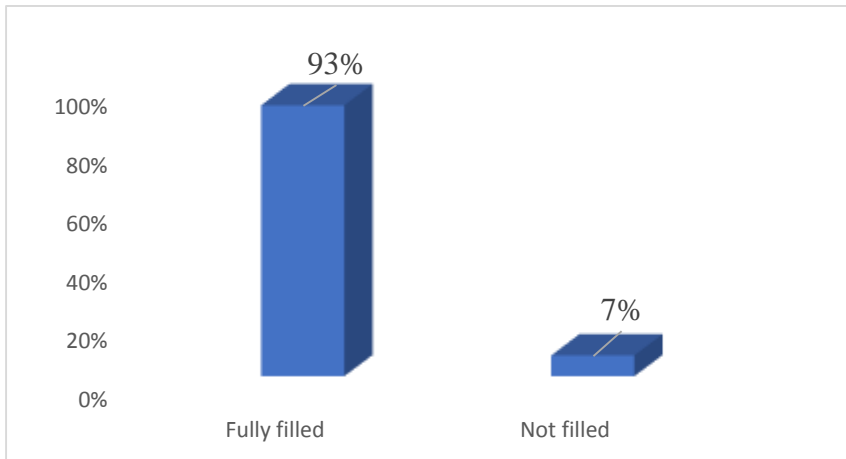
### **4.1 Introduction**

The study is organized into three key areas: Introduction, responsiveness of the study, general information regarding study participants and key results. Additionally, the study has presented discussion of key findings.

### **4.2 Response rate**

The study constructed and administered 84 questionnaires to the study participants operating at commercial banks Head offices in Nairobi. Upon completion of data collection, a total of 78 questionnaires were returned and fully filled by the respondents while 6 were returned unfilled. This generated a response rate of 93% as shown in figure 4.1. The high response is attributed to respondent's understanding of English and early intervention made by the researcher in pretesting the data collection instrument. In addition, this study adopted a strategy by Kaplowitz, Hadlock and Levine, (2004) who proposed that in order to have high response rate, it is important to use many field contacts, appear most of the time in the field, provide, personalization, and sponsorship have significant impacts on survey response rates. As noted by Dillman (2011) a high response can be achieved and prior researchers have achieved.

**Figure 4.1 Response rate**

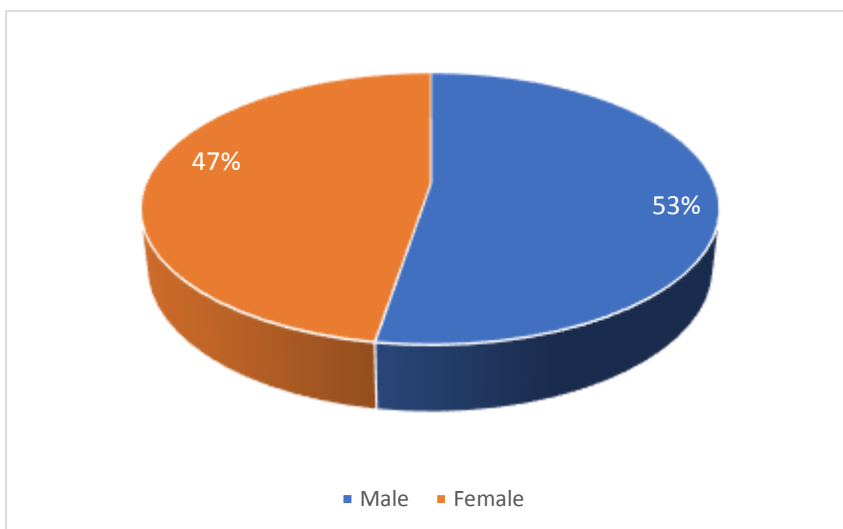


### **4.3 Demographic Information**

#### **4.3.1 Gender**

Regarding respondent's gender, of the total respondents, majority were men (53%) compared to women 47% as shown in figure 4.2. This means gender was fairly represented in the study and diverse perspective on the topic under study can be received from both genders.

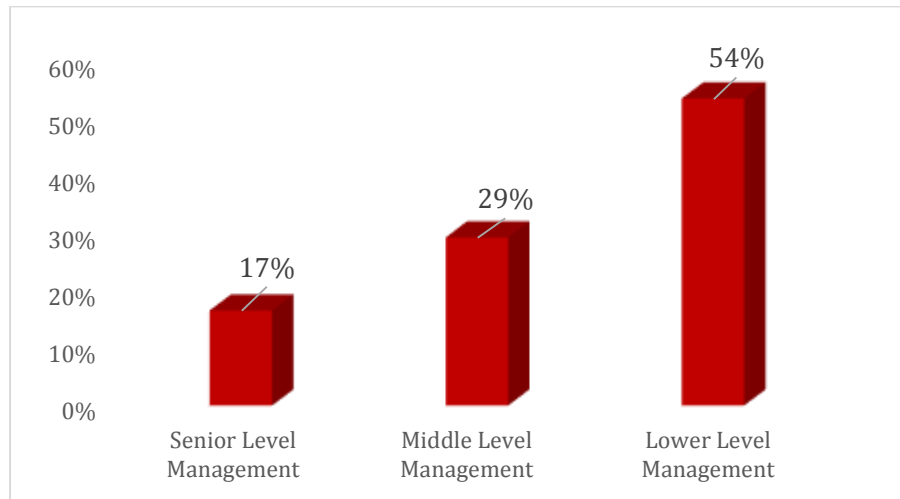
**Figure 4.2: Gender**



### 4.3.2 Management level

On the levels of management identified by respondents, majority 54% belong to lower management level followed by middle level management with 29% and 17% represented those senior management level as shown in figure 4.3. This means the sample was representative and provided diverse information on technological innovation in commercial banks as received by the researcher.

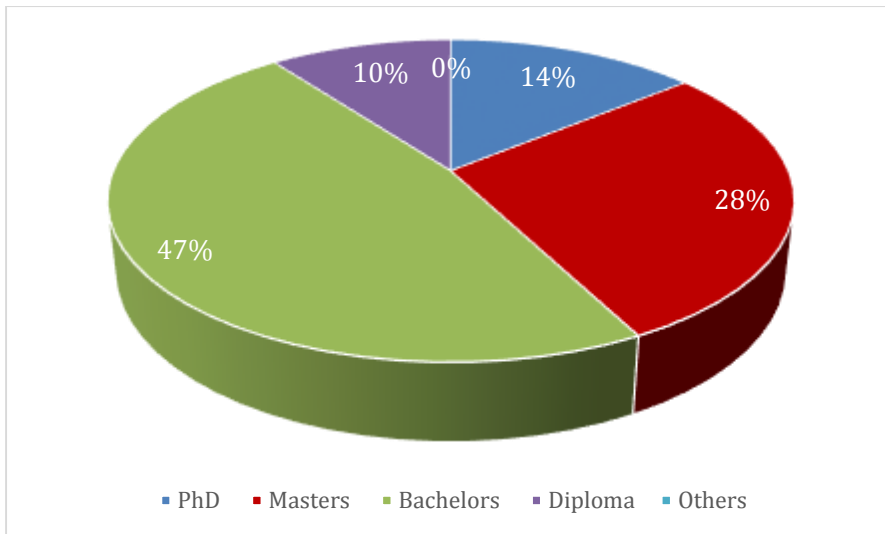
**Figure 4.3 Management level**



### 4.3.3 Level of education

Figure 4.4 represents the highest level of academic qualification that respondents had obtained. Of the total respondents, 37(47%) had completed university with bachelor's degree while those with masters constituted 28% and diploma (10%), and 14% had PhDs. The implication is that all respondents might have been able to complete the questions themselves or understood the questions making fill the questionnaire without difficulties.

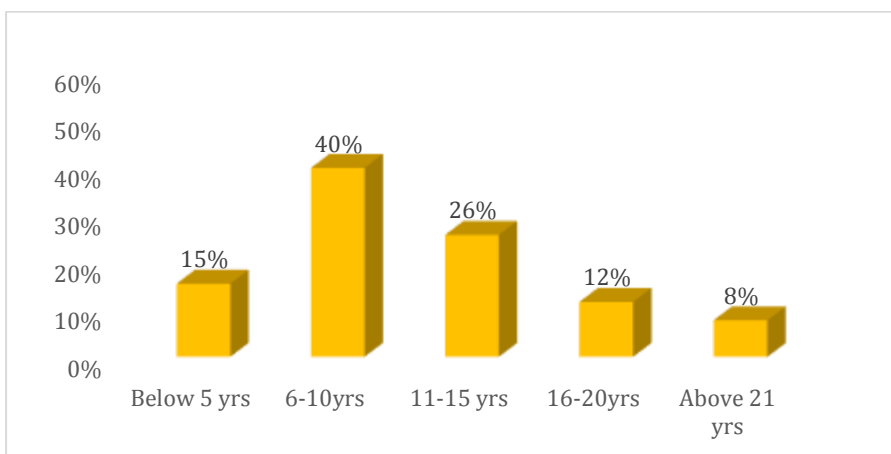
**Figure 4.4: Level of education**



#### **4.3.4 The number of years in the Banking Sector**

Figure 4.5 presents distribution of respondents by the number of years in which they had worked in the banking sector. Figure 4.5 depicts the findings of their response. Majority 40% had worked for 6-10 years followed by those who had worked for 11-15 years (26%). In addition, the study focused that 15% had worked for 5 years and below, 12% worked for 16-20 years and least for above 21 years. This implies that the respondents working at the commercial banks have the experience which can help them respond to the questions.

**Figure 4.5: Number of years in the industry**

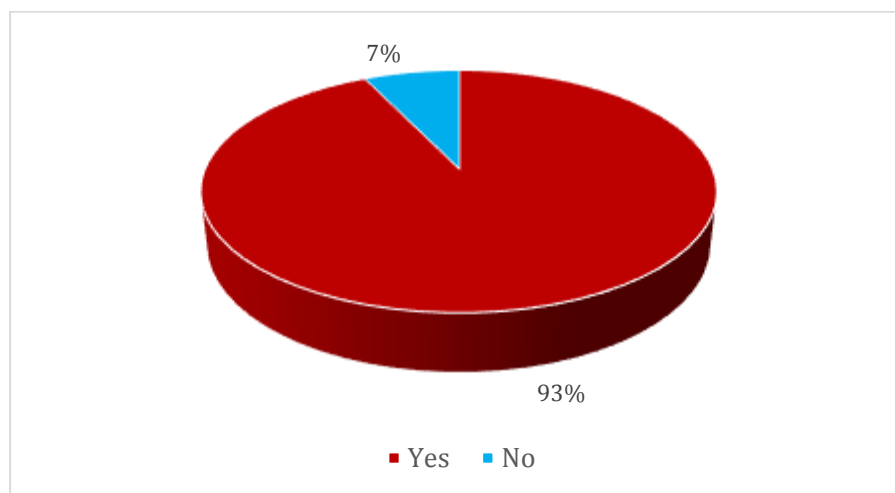




#### 4.3.5 Do your institutions use Pesalink?

Figure 4.6, depicts findings on adoption of Pesalink by commercial banks in Kenya. While only 7% had not adopted Pesalink, a significant number had adopted the electronic payment system which allows real-time 24-hour day digital payment solution to banks. This implies the commercial banks selected for the study can provide the required information because they have adopted Pesalink as a technological innovation which is the research under this study.

**Figure 4.6 Use of Pesalink**



#### 4.4 Extent of Adoption of Technological Innovation by Banks

In estimating extent in which commercial banks have adopted technological innovation (in particular Pesalink payment system) some models of technological innovation are tested. The results are presented in table 4.1.

The study has found that most of the respondents represented by an average mean of 3.438 agrees to a larger extent that commercial banks have adopted technological innovation. On how banks have enhanced their performance through technological innovation, we can see the commercial banks in Kenya have invested heavily on IT hardware (mobile apps, servers) (Mean of 4.04 and standard of 0.66). The implication is that there is improvement of efficiency, quality and the speed in delivering customers services. The study also found that the use of online platform for monitoring transactions had consistent scores with lower mean of 3.26 and standard deviation of 0.527. In addition,

with a mean of 4.01 and standard deviation of 0.576, respondents were in agreement that most commercial banks had adopted USSD mobile banking. While USSD mobile is favoured among respondents, the p-value is 0.021 which is higher.

The study also shows that banks have extensively used digital channel – Pesalink in obtaining financial information with an average mean of 3.34 and standard deviation of 0.482. Table 4.2 shows the effects of technological innovation and performance in measures. The estimated linear regression is statistically significant at .05%. Additionally, R-square values in the regression explains high percentages of variability in the dependent variable (R-square = 0.678 (68%) and p-value of 0.00429.

As shown in table 4.2, the findings reveal that adoption of technological innovation such Pesalink have significant effect on performance of commercial banks. We can see that increased use of USSD mobile banking and improvement of IT hardware has p-value of 0.021 and 0.003 respectively. Furthermore, agency banking has a p-value of 0.007 and expected increased adoption online banking platform enhanced performance of banks as it and p-value of 0.008.

**Table 4.1 Extent of adoption of technological innovation**

Statement	Mean	SD
Commercial banks extensively utilize Internet Banking channel to obtain financial information	3.34	0.482
We have online platform for monitoring transactions	3.26	0.527
The banks extensively utilize agency banking channel	3.54	0.511
We have invested much resources on IT hardware (Servers, laptops, computer, mobile/mobile apps) to improve work performance	4.04	0.669
We have adopted USSD Mobile Banking	4.01	0.576
Average	3.438	

**Table 4.2 Summary output**

<b>Rgression Statistic</b>					
Multiple R	0.7871				
R Square	0.6782				
Adjusted R Square	0.6954				
Standard Error	35.3721				
Observation	4				
<b>ANOVA</b>					
	df	SS	MS	F	Sig
Regression	1	2561.348	3782.563	21.7869	0.00429
Residual	4	6734.819	2731.033		
Total	5	4638.328			
<b>Coefficien</b>					
		Standard	It Stat	P-Value	
Intercept	105.311	45.176	1.567	0.002	
Online banking plat	78.101	40.316	1.987	0.008	
Agency banking	72.564	42.679	1.781	0.007	
IT Hardware	70.119	39.875	1.592	0.003	
USSD Mobile Banki	66.314	41.592	2.045	0.021	

#### 4.5 Technological Innovation Challenges Faced by Banks

The study sought to examine the technological challenges faced by commercial banks which can affect their performance. Results show that most of the respondents agreed that several technological challenges are noted among commercial banks represented with average mean of 3.734. One of the greatest challenges facing banks as identified by respondent is inadequate research investment which is meant to change customer behavior represented by mean of 3.44 and standard deviation of 0.522. Additionally, most of the respondents indicated that lack of expertise to handle regulatory requirements especially technological innovation as shown by mean of 3.78 and standard deviation of 0.613. With a mean of 3.05 and standard deviation of 0.689, it shows respondents were in agreement that weak IT infrastructure is one of the major challenges and can affect how banks handle emerging issues in the banking sector. Suspicion and trust in technology tools in the banking sector affected adoption of technological innovation the as shown by a mean of 3.81 and the effects of lack of insecurity and in the technologic used among banks is shown by a mean of 3.59 and standard deviation of 0.539.

Table 4.3 presents results of model summary. The results shown that R-Square is 0.7128 and this means the regression model accounts for 71% of variations. This means the model is fit for analysis. The entire variable had a statistically significant effect of performance of commercial banks and these banks were likely to underperform because of the identified challenges.

**Table 4.3 Technological innovation challenges**

Statement	Mean	SD
Lack of expertise to handle regulatory requirements	3.78	0.613
Weak infrastructure to most institutions	3.05	0.689
Suspicion and trust in technology tools in the banking sector affecting adoption of technological innovation	3.81	0.577
Inadequate research investment to change customer behavior	3.44	0.522
Lack of security and trust in adoption of technology innovation tools in the banking industry	3.59	0.539
Average	3.734	

#### **4.6 Performance of Commercial Banks**

The results shown that the increasing adoption of technological innovation by commercial banks in Kenya had resulted to increase in data accessible as shown by a mean of 3.15 and standard deviation of 0.579. Moreover, as indicated by the study findings, a consistent effect was observed in the integration process as a result of the banks adoption of technological innovation as shown by a mean of 3.71 and standard deviation of 0.582. The study findings show adoption of technological innovation had enhanced banks internal efficiency as represented by a mean of 3.12 and standard deviation of 0.595.

Further the study found that technological innovation had improved banks accounting information management and reporting and had a mean of 3.73 and standard deviation of 0.566. In overall, the effect of technological innovation on performance of commercial banks had an average mean of 3.428.

Table 4.4 presents a breakdown of the results on the effects of technological innovation on performance after regression analysis. The results of R-Square are 0.6761 explaining 68% of the variability of data. This explains 68% of the variables of data. The explanation is that the model is fit for analysis and the entire variables had a statistical effect on performance.

**Table 4.4 Performance of commercial banks**

Statement	Mean	SD
Increased adoption of technology in banks has increased data accessibility	3.15	0.579
Technological innovation has facilitated integration of processes	3.71	0.582
Internal efficiency has been enhanced by technological innovation	3.12	0.595
Technological innovation has improved accounting information management and reporting	3.73	0.566
Average	3.428	

#### **4.7. Discussion of Findings**

This study and that adoption of technological innovation by commercial banks had a significant effect on the overall performance. These findings from the current study are in line with previous studies. For example, a study by Lankkanea, (2016) reveals emergence of mobile banking, is linked to time saving, flexibility of financial access and cost saving which in turn results to increased performance. The study findings reveal that most have utilized online platform in monitoring customer transactions and also these banks have invested heavily on IT hardware which help them take advantage of emergence of internet banking. One of the greatest innovations that has taken place in the banking sector is the adoption of Pesalink and this has enhanced performance.

Moreover, adoption of technological innovation such as Pesalink as made it easier for banks to share and receive financial information. The findings from this study agrees with previous similar studies which reported increase in performance done to information interruptions. Khan (2010) revealed the merits of application of telecommunication technologies in the banking sector.

In Kenya, the decision to be a new bank client largely will be influenced by the availability of an innovative internet banking system and also the availability of ATMs within the locality. As such, most of the bank's clients rely on ATMs and internet banking instead of actual visit to the bank's branches.

The findings also show bank customers make transactions at their destination. However, despite having positive effect in the banking sector, there are technological challenges. For example, insecurity is cited as one of the greatest challenges confronting commercial banks in using technology. This is in agreement with a study by Rahi & Abd.Ghani (2018) who found that innovativeness and perceived technology security affects banks financial performance because customers of fear of internet banking.

## **CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATION**

### **5.1 Introduction**

This chapter discusses summary of the findings based on the observed data in the above sections. It will also discuss the conclusion and recommendations as guided by objectives.

### **5.2 Summary**

Results presented in this study is based analysis of 78 questionnaires that were collected after data collection process completed and as this achieved a response rate of 93%. This kind of response was deemed for analysis and summary of the key findings.

Majority of the respondents were male with most of them being employees of the lower management level. On the highest level of education, most had bachelors and mater degree with majority stating they had been in the industry for between 6-10 years suggesting they had adequate experience to handle the topic under study. Almost commercial banks, selected for this study use Pesalink a technological innovation which enhances service delivery in the banking sector.

Respondents were asked to indicate the level of extent to which commercial banks have adopted technological innovation and how it has affected performance. This was represented by average mean of 3.438. Using a regression analysis, the study found R-square 0.6782 and P-value of 0.00429. This show there is positive on performance of commercial banks. The investment in financial software has little influence on the return on assets and the return on equity of Kenyan banks.

On the challenges focusing commercial in the adoption of technological innovation most of the respondents were in agreement that several challenges exist. For example, lack of expertise to handle regularly requirements was rated with mean of 3.78 and standard deviation of 0.618. Generally, this study reports that technological diversity affects performance of banks and technological innovation is positively linked to performance.

### **5.3 Conclusion**

The examination of link between technology innovation and the performance of commercial banks is crucial for bankers, stakeholders and even bank customers. Today, technological innovation in the banking industry is very important because it has the potentials of improving bank's profitability and offer a new competitive advantage. Based on data analyzed, this study concludes that innovation is relevant also for bank customers. Almost all the bank selected for the study had adopted Pesalink (one of the technologies) and utilized mobile banking and online platform in sharing and receiving information. This has become a tremendous opportunity for Kenya's financial industry because it can be very quick and innovative.

The study concludes that most commercial bank were likely to be faced with technological innovation challenges such as insecurity or lack of expertise. The study concludes that any commercial bank that is willing to progress should continuously adapt to changing economic, financial and productive context especially in this era of technological innovation.

### **5.4 Recommendations**

Considering that internet and mobile channels can process a higher volume of transactions compared to the use of the conventional manual processes, commercial banks should therefore invest in maximization of the return benefits realized from digital channels such as mobile and internet banking.

### **5.5 Limitations**

The present study focused on all commercial banks in Nairobi County. Since this study concentrated on 42 commercial banks, the findings might not be generalized into all other financial institutions because they weren't captured at first.

The target respondents were bank employee whose schedule were tight and this made the researcher to readjust her schedule. Moreover, some banks were reluctant in providing information required to write this research project. During administration of questionnaire, the researcher had distributed to some respondents but at the time of collecting, some were reluctant in completing the entire questionnaire but the researcher tried



to convince them explaining that the incomplete questionnaire will be discarded. Therefore, having many incomplete questionnaires affect response rate.

### **5.6 Suggestions for further research**

The present study focused only on commercial banks but it would be interesting to conduct future research on technological innovation and performance of microfinance. The study found that mobile banking processes and hence the study recommends future studies can be carried out to examine bank's investment on mobile banking.

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## **APPENDICES**

### **APPENDIX I: LIST OF COMMERCIAL BANKS**

1. African Banking Corporation
2. Bank of India
3. Bank of Baroda
4. UBA Bank Kenya
5. Victoria Commercial Bank
6. Trans-National Bank
7. Stanbic Bank
8. Standard Chartered
9. Spire Bank
10. Prime Bank
11. NIC Bank
12. Sidian Bank
13. SBM Bank
14. National Bank
15. Middle East Bank
16. Guardian Bank
17. Guaranty Trust Bank
18. First Community Bank
19. Paramount Universal Bank
20. M-Oriental Commercial Bank
21. Mayfair Bank
22. KCB
23. Jamii Bora
24. Imperial Bank
25. I&M Bank
26. Housing Finance
27. Habib A.G. Zurich
28. Gulf Bank
29. Family Bank
30. Equity Bank

31. Eco Bank
32. DIB Bank
33. Diamond Trust Bank
34. Development Bank
35. Credit Bank
36. Cooperative Bank
37. Consolidated Bank
38. Citi Bank
39. Chase Bank
40. CBA Bank
41. Barclays Bank
42. Bank of Africa

## APPENDIX II: QUESTIONNAIRE

Dear respondent,

This is to request you to help the researcher answer the following questions in this questionnaire. This study is an academic paper and your responses will be kept confidential. Please tick  only box, which corresponds to your choice.

### SECTION A: DEMOGRAPHIC CHARACTERISTICS

1. Bank Name .....
2. Gender  
Male [ ]      Female [ ]
3. What is your management level in the bank?  
Senior Level Management        
Middle Level Management        
Lower Level Management
4. level of Education  
PhD                    [ ]                    Masters                    [ ]  
Bachelors            [ ]                    Diploma                    [ ]  
Others                    [ ]
5. For how long have you been working in the banking industry?  
Below 5 yrs      [ ]  
6-10yrs            [ ]  
11-15 yrs            [ ]  
16-20yrs            [ ]  
Above 21 yrs      [ ]
6. Do your institutions use Pesalink?  
Yes [ ]                    No [ ]

**SECTION B: EXTENT OF ADOPTION OF TECHNOLOGICAL INNOVATION BY BANKS**

The questions in this section requires you to choose one option using a scale of between 1 and 5. In this option; 1 = To no extent; 2 = To a little extent; 3 = To a moderate extent; 4 = To a great extent and 5 = To a very great extent.

No	Statement	1	2	3	4	5
1.	Commercial banks extensively utilize Internet Banking channel to obtain financial information					
2.	The banks extensively utilize agency banking channel					
3.	Commercial banks have online platform for resolving customer issues and get statements					
4.	We have invested much resources on IT hardware (Servers, laptops, computer, mobile/mobile apps) to improve work performance					
5.	Banks invests in research					

**SECTION D: TECHNOLOGICAL INNOVATION CHALLENGES FACED BY COMMERCIAL BANKS**

No	Statement	1	2	3	4	5
1.	Lack of expertise to handle regulatory requirements					
2.	Weak infrastructure to most institutions					
3.	Suspicious and trust in technology tools in the banking sector affecting adoption of technological innovation					
4.	Inadequate research investment to change customer behavior					
5.	Lack of security and trust in adoption of technology innovation tools in the banking industry					



**SECTION C: PERFORMANCE OF COMMERCIAL BANKS**

NO	Statement	1	2	3	4	5
1.	Increased adoption of technology in banks has increased data accessibility					
2.	Technological innovation has facilitated integration of processes					
3.	Internal efficiency has been enhanced by technological innovation					
4.	Technological innovation has improved accounting information management and reporting					

Thank you for your co-operation