

**IMPACTS OF TECHNOLOGICAL INNOVATIONS ON THE FINANCIAL PERFORMANCE
OF COMMERCIAL BANKS IN KENYA**

BY

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DECLARATION

This Research Project is my original work and has not been submitted by any other person for an award or any other consideration in other institutions.

Signature.......... Date.....22/02/2022.....

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This research project is submitted for examination with my approval as University Supervisor.

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DEDICATION

This research project is dedicated to my workmates, family, and my employer for the patience and support they gave me during this research project.

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ABBREVIATIONS

ATMs	Automated Teller Machines
CBK	Central Bank of Kenya
CCK	Communication Commission of Kenya
DTB	Diamond Trust Bank
KBA	Kenya Bankers Association
KCB	Kenya Commercial Bank
PEOU	Perceived Ease of Usefulness
PDQ	Process Data Quickly
PU	Perceived Usefulness
ROA	Return on Assets
ROE	Return on Equity

ABSTRACT

Business environment especially the financial sector has continued to be more competitive in the recent years. The competition has been attributed to the increasing uptake of various technological innovations such as agency banking, mobile banking, internet banking, and ATMs usage, being adopted by commercial banks. However, despite the uptake, many of the commercial banks continue to struggle with growth particularly in their overall financial performance. Therefore, this project work established the theoretical and conceptual relationship on the impacts of technological innovations applied on the financial development of commercial banks in Kenya. The project employed the return on assets as a measure of performance and the total transactions on agency, mobile and ATMs as measures of the technological uptake. The research was conducted on the 43 registered commercial banks from 2011 to 2020. From the regression analysis carried, the study deduced that indeed there is a positive correlation between financial performance of commercial banks and the technological innovations being used. However, despite this tremendous output, there are still gaps in the uptake. Therefore, the study proposes further research work to be conducted to indentify some of the hindrance factors that affect the update of new technological innovations in Kenya.

CHAPTER ONE: INTRODUCTION

1. Background of the Study

It is not with doubt that the revolutions in the technological industry have created an unprecedented business environment in different sectors across the world. Kenya, being a young growing economy has not been spared either particularly in the financial market. The introduction has changed the business operational models of many commercial banks owing to the need by most of them to minimize their operational costs that arises from huge workforce. Technological innovations are deemed to be the game changers in the way commercial banks operate their business models in realizing their objective of profit maximization. However, the balance between maximization of profits and minimization of administrative and operational costs lies on the level of technological uptake and which have seen serious challenges in the recent past. Sometimes the costs incurred in installing a new technological innovation surpasses the savings made on cost minimization.

Therefore, to cope with the growing need to have the balance, commercial banks have formulated various policies and interventions that create the balance. These policies are in the area of effective and efficient uptake of technology innovations (Sahay et al., 2020). The remodeling such as use of ATMs, mobile banking, increased e-banking, widened easy banking platforms, shifts in work schedules due to teleconferencing innovations, and agency banking are among the interventions that have been made to create the balance (Kombe & Wafula, 2015). As illustrated by the innovation diffusion theory, constraint-induced financial innovation theory, and the technology acceptance model theory (Wani & Ali, 2015), the adoption of new innovations is inevitable especially with the new business environment full of systematic risks caused by external factors such as Covid-19 pandemic.

However, despite all these innovations being adopted in the banking sector, what remains unclear is whether they have produced the desired goals of customer satisfaction and a shift in the cost management

by different commercial banks particularly in the peculiar times like this with Covid-19 ravaging most of the economies. Therefore, the research was designed to investigate how these technological transformations have helped to boost the overall financial performance of different lending financial institutions in Kenya. It looked at the proportion to which various players in the banking sector have adopted the emerging technologies and the impact they have created in improving their financial performance.

1.1 Technological Innovations

The impact of technology on economic growth is undisputed and has continued to grow over the years with technology playing a crucial role in innovations. Although innovation is a multifaceted subject, different scholars have defined innovation in ways that represent the usage and nature of its role in society. According to Schumpeter, innovation is an application of new ideas to solve new and emerging problems in society (Timur & Antanas, 2017). Twiss on the other hand defined innovation as a process that combines science, economics, technology, and management in solving emerging issues such the globalization and current Covid-19 (Timur & Antanas, 2017). Even though the two scholars differ in the approach, what remains constant is that innovation is targeted at providing a solution to an emergency.

Therefore, in order to compete favourably, various commercial banks have taken strides and the adoption of technology has come as a game-changer in the industry. Although even before Covid-19, various banks had adopted the new technological ways of doing business; such pandemics like Covid-19 has accelerated its uptake and usage. Technology has been a very vital resource in the innovation of new products, expansion of the products lines, sustaining competition, and also securing optimal business operations and processes (Murad & Thomson, 2011). As mentioned earlier, these various innovative technologies have had a great impact in creating seamless business operations in the banking sector. Globally, these innovations have created a different business environment concerning the disrupted

international business operations. Therefore, this paper will explore how they have shifted operations in the banking sector in Kenya to promote effective overall performance of commercial banks.

1.1 Financial Performance of Banking Sector in Kenya

The concept of technological advancements and developments of commercial banks has remained a key aspect and has drawn attention among many researchers. Indeed, commercial banks play a vital role in resource redistribution as an intermediate between the clients and the capital sources. As such, their performance is very pivotal in ensuring equity in the resource allocation. In Kenya, the banking sector has posted a very commendable outcome especially in their key role of socio- economic development of the society. This can be attributed to; the favourable business environment that has been put in place by the government and the adoption of technological innovations. According to Mugo (2012) and Boachie-Mensah and Issau (2015), the innovativeness of various financial institutions such as commercial banks has remained the driving factor to the success of such firms. Boachie-Mensah (2015) illustrates that such innovations account for almost 50% of the overall performance of commercial banks. The performance is measured by different variables including operational efficiency, ROA, ROE, profitability, and good governance.

Since the technological revolution began, various banks in Kenya have continued to record overwhelming performance an aspect that has not only boosted the financial industry but also the overall economic market (Demirgüç-Kunt et al., 2020). Effective and proper use of technological innovations such as e-banking, agency banking, ATMs, and Mobile banking has created seamless business operations thus higher performances. Nevertheless, there are no research works that have been done to demonstrate that these technological innovations that are used help such institutions to accelerate their financial performances. This, therefore, formed the basis of this study, particularly with the Kenyan context.

1.1.2 Technological Innovations and Financial Performance of commercial banks in Kenya

The tremendous steps taken by the banking industry to adopt new technological innovations in Kenya cannot be underestimated. Although the technological innovations had taken root, many of these institutions did not fully embrace the new changes and depended on one on one interaction with their clients. Long queues could be seen in the banking halls across the country despite the widely spread technological advancements. This may be explained by the appealing nature of one on one business interaction. However, with the unexpected market factors such as the outbreak of Covid-19, many commercial banks had to fully embrace technology (Ellen et al., 2021). The pandemic stopped the overcrowding in the banking halls. As such, new ways had to be invented by these commercial banks not only to remain afloat but also to meet customer satisfaction. But despite the interventions, some of the banks still struggle to remain in business with massive layoffs and contradictory tactics. Hence, this paper investigated the significant role that such technological interventions have created in promoting the financial development of the banking sector in Kenya.

1.2 Research Problem

The adoption of various technologies by different commercial banks including internet banking, use of ATMs, Mobile banking, and agency banking have been examined by different researchers. This is an indication that use of technology especially in the banking sector took root long before. According to Anbalagan (2011) and Gikandi and Bloor (2010), there are various Kenyans who are using internet banking, mobile banking, ATMs, and agency banking courtesy of new technological advancements. However, they observed that most of these users rarely become ardent and constant users of these platforms. This assertion has also been ascertained by Munyoki and Ngigi (2012) in their work, “challenges of e-banking among commercial banks in Kenya”. Additionally, Rono (2015) also examined various factors of electronic banking performance of commercial banks in Kenya. Nonetheless, to cope

with the new business environment caused by the huge need of electronic world and emergence of Covid-19, the usage of such technologies has been accelerated. Many commercial banks have operationalised different technological steps not only to remain afloat but also to adhere to the realization that use of technology especially in the banking sector seem to be the game changer in both profit maximization and cost minimization. According to Anbalagan (2011) and Gikandi and Bloor (2010), there are various Kenyans who are using internet banking courtesy of new technological advancements. However, they observed that most of these users rarely become ardent and constant users of these platforms. This assertion has also been ascertained by Munyoki and Ngigi (2012) in their work, “challenges of e-banking among commercial banks in Kenya”. Additionally, Rono (2015) also examined various factors of electronic banking performance of commercial banks in Kenya. Nonetheless, to cope with the new business environment caused by the emergence of Covid-19, the usage of such technologies has been accelerated. Many commercial banks have operationalized different technological steps not only to remain afloat but also to adhere to government regulations.

Although these various studies have underscored the significance of these technological innovations, none of them have outlined the overall effects of such technologies on the development of financial institutions in Kenya, particularly during this period where customers are more enlightened and appreciate the new technologies. Therefore, this study sought to bridge the gap by investigating the overall impacts of these technological developments on the financial progression of commercial banks in Kenya during this unprecedented business environment.

1.3 Research Objectives

The purpose of the article was to establish the impacts of technological developments in accelerating the overall improvement of commercial banks in Kenya.

1.3.1 Specific Objectives

The research was anchored on two specific objectives:

- i. To establish the various technological innovations that have been adopted by different commercial banks in Kenya.
- ii. How such innovative technologies adopted have affected the financial performance of commercial banks in Kenya.

1.4 Value of the Study

This research project is crucial to commercial banks and other financial institutions in Kenya. The disruptions necessitated by the Covid-19 pandemic in the banking industry have serious ramifications on the overall economic development. According to Nechifor et al. (2020), for instance, the overall Gross Domestic Product shrunk from 5.6% to 4.8% during the first quarter of 2020. Since banks play a significant role in economic acceleration, such drastic reductions in financial activities result in the slow financial and operational improvement of commercial banks. The study, therefore, forms a fundamental base of policy formulation particularly in the area of banking technology.

Moreover, government also stands a greater chance of benefiting from this research work. With accelerated rate of technological outreach, various policies and interventions need to be put in place to caution the public on the wrong use of such technologies. But since the government is the sole regulator of such uptake, this research will provide an avenue for adequate and proper policy formulations that will guide such technological adoption and implementation.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter configures the theoretical landscape of different theories that explain the concept of technological innovations and the impacts they have on the improvement of the banking industry. It starts by discussing the theoretical review of some of the hypothesis that formed the basis of the study and then determinant objects that anchor the financial achievement of commercial banks in Kenya as well as the empirical studies. This, therefore, formed the foundation of the development of the conceptual framework to be used at the end of the chapter.

2.2 Theoretical Review

Numerous conjectures have been put forward by different researchers on the topic of technological innovation. However, in this research, only those that are deemed relevant were discussed. Some of these theories included; innovation diffusion, constraint-induced financial theory, and technology acceptance theory.

2.2.1 Innovation Diffusion Theory

Many decades ago, technology was a little-known term. The gap between technologically innovative ideas and innovations was huge and less was expected. However, the last few decades have witnessed tremendous developments of technological innovations that have reversed the pathway of doing business thanks to diffusion theory (Wani & Ali, 2015). This theory was first developed by Rodgers in 1962 and later developed in 1995. It explains how an idea like technological innovations can gain track (spread) within a specific population (Wani & Ali, 2015). In his argument, Rogers focused on the how, when and what drives the diffusion rate rather than the persuasion of individuals. In the current world, change especially in technology is inevitable.

Although the degree of adoption differs from early adopters to late adopters, the business environment has necessitated the change (Wani & Ali, 2015).

Emergent issues such as globalization, and now Covid-19 pandemic are some of the driving forces to the development of technological innovations. Rogers acknowledged the role played by technology in the development of products and services that satisfies customer needs. Nonetheless, the opponents of the theory have not missed to paint it negative. According to Lyytinen and Damsgaard (2001), technology is never a discrete package that can diffuse wholly. For instance, in the banking sector, the use of ATMs, Mobile banking, E-banking, and agency banking among many technologies may not be wholly diffused. Neither can the rate at which such technologies have diffused communicate success. As such, the diffusion theory must not be studied in isolation. The significance of diffusion of technology is the knowledge and products thereof (Wani & Ali, 2015). However, the theory is so significant in this study as it looks at how various technologies diffuse regardless of the rate thus forms a basic foundation of the study.

2.2.2 Constraint-Induced Financial Innovation Theory

The theory was put forward by William Silber in 1983 following a serious look into the various constraints that proved detrimental to the growth of the banking sector (Achieng et al., 2015). According to this theory, every business entity strives for profit maximization. Therefore, the development of different financial innovations accelerates the growth thus profit is maximized. But the development of such innovative ideas may be hindered by macro-factors such as management structures and other externally-induced factors such as the Covid-19 pandemic and globalization among other factors. With the impacts created by the urgent need to incorporate technological innovations in the business operations, only such firms which can sustain the constraints can survive. As such, every entity in the banking sector has taken steps to create room for innovative ideas including e-banking, mobile banking,

ATMs, and agency banking facilities among others.

Although this theory is so representative as it underscores the financial innovation within the microeconomic environment, its opponents fault its inclusiveness. More often, financial innovation does not take place in isolation as suggested by the theory. This, therefore, makes it difficult to express the ideological aspect of financial innovation in a more liberal finance market (Achieng et al., 2015). However, it proves ideal for this study as it outlines the fundamental model to deal with certain constraints that might hinder financial innovation especially at this time of the pandemic, and which is the basis of this study.

2.2.3 Technology Acceptance Theory

Technological advancements and integration into the business environment particularly in the banking sector have created a tremendous shift in business operations. This new trend has caused threats to the newly incorporated business models and at the same time created more business opportunities for those firms that have been able to adopt such new technologies (Lai, 2016). Although, the fundamental question that lingers in many minds is the question of acceptability or rejection. Different banking entities such as Equity, KCB, DTB, and Absa bank among other leading commercial banks normally leverage on the evolution of technology to take advantage of the same. The development of systems such as e-payment, use of ATMs, Mobile money, and agency banking among others are some of the technological advancements that banks have taken lead in developing. However, as illustrated earlier, what remains a puzzle is how well these technologies have been accepted by the consumers and the kind of leverage they bring to the commercial banks.

Therefore, in order to underscore this Fred Davis developed the technology acceptance model in 1989 that can be used to predict the levels of technology acceptance or rejection (Lai, 2017). In his model, Fred acknowledged that the acceptability of such technologies can be looked at in two ways; perceived

usefulness (PU) and perceived ease of use (PEOU). As such, even when the banking sector in Kenya incorporates such technologies into their systems the biggest success strategy is whether such technologies are useful in their quest for profit maximization. However, this can only be possible if clients can use such technologies efficiently. This theory was a classic basis for this study as it helped underscoring how clients have fully accepted or rejected the technologies adopted by these commercial banks and which are used by the commercial banks to cope with the increasing technological competition in the banking sector.

2.3 Determinants of Performance of Commercial Banks

Banking industry has a significant contribution towards the development and resuscitation of the economy especially at this unprecedented times. As such their performance and sustainability are crucial. Although technological development is key in the sustainability of such entities, many commercial banks in Kenya have used different ways to promote their performance effectively. Some of the major ways include; capital adequacy, liquidity management, and management efficiency through proper corporate governance.

2.3.1 Liquidity Management

Although technology may play a significant role in promoting financial performance as put forward by different authors, proper management of liquidity also forms an essential pillar in financial development. Liquidity management is the proper fulfillment of business obligations as they fall due. In this case, customers deposits comes first. When a bank can manage customer deposits in such a way that when customers want to withdraw they find funds to withdraw readily and efficiently, such commercial banks will increase its deposit accounts thus high financial performance.

2.3.2 Corporate Governance

According to Momanyi, Ragama, and Kibati, (2018) argue that to achieve high financial performances in the commercial banks, corporate governance is crucial. Every organization that develops proper governing structures is more likely to gain better than those dependent only on the clientele base. Having a huge client base is essential. However, if not well managed through laying down proper foundations, oversights, monitoring, accountability, and ethical management; such efforts may be a waste. As such, the managers of these commercial banks need to incorporate corporate governance to realize full financial performance.

2.4 Empirical Studies

The banking sector in Kenya plays a pivotal role in economic recovery and development, particularly at this unforeseen business environment stage where technology is everything. Their financial performance, therefore, is essential in pushing for such desired recoveries. Locally, various studies have been put forward to underscore the concept of technological use in coping with the globalization and other growing trends in the financial industry such as use of crypto currencies. According to the study "Effects of e-banking on the overall success of the banking sector in Kenya in 2017" by Kanyoro, revealed that performance of commercial banks relies on the adopted technological advancement. In their study, the two used descriptive research methods and which comprised of data from the CBK and 123 respondents from the 41 commercial banks in Kenya focused on e-banking (Kanyoro, 2018). From their study, they concluded that e-banking is essential in creating a more strategically leveraged business. Although this may be true, what remains unclear is whether such technologies are capable of creating a smooth business environment that promotes financial improvement of the commercial banks. Nevertheless, it formed the foundation of interrogation in the study. Similarly, Munyoki and Ngigi (2012) in their work, challenges of e-banking among commercial banks in Kenya, acknowledge the contribution of technology in the

banking sector. The study was done in Kenya in 2010 and used a descriptive research method to interview respondents from all the 43 commercial banks. From their analysis, there was a consensus that technology is vital in creating a more inclusive financial market. The use of e-banking is beneficial but with serious challenges. As such, it was difficult to ascertain if such technologies are able to promote the financial performance of commercial banks during this technological revolution times. This assertion was also upheld by research done by Adewoye on impacts of mobile banking on service delivery by commercial banks in Nigeria in 2012 (Adewoye, 2013). In his article, Adewoye agreed that technology was so essential in the progression of any institution and commercial banks are no deviation. Therefore, these empirical studies formed the fundamental basis of this study.

2.5 The Conceptual Framework

The conceptual model is an illustration of the correlation that exists between the independent variable and the dependent variable. In this article, the financial performance of different commercial banks was dependent on the levels of technological inputs such entities use ATMs, agency banking as well as the mobile banking. Therefore, technological innovation was the independent variable while the financial performance of the commercial banks was the dependent variable. As illustrated in the figure below, the levels of performance was measured by the level of return on assets (ROA) that the commercial banks reported from 2011 to 2020. Technological innovations, on the other hand, was estimated by; the number of transactions carried out on ATMs, PDQ machines use by the agents in the agency banking and also the mobile banking transactions. The framework was developed as follows:

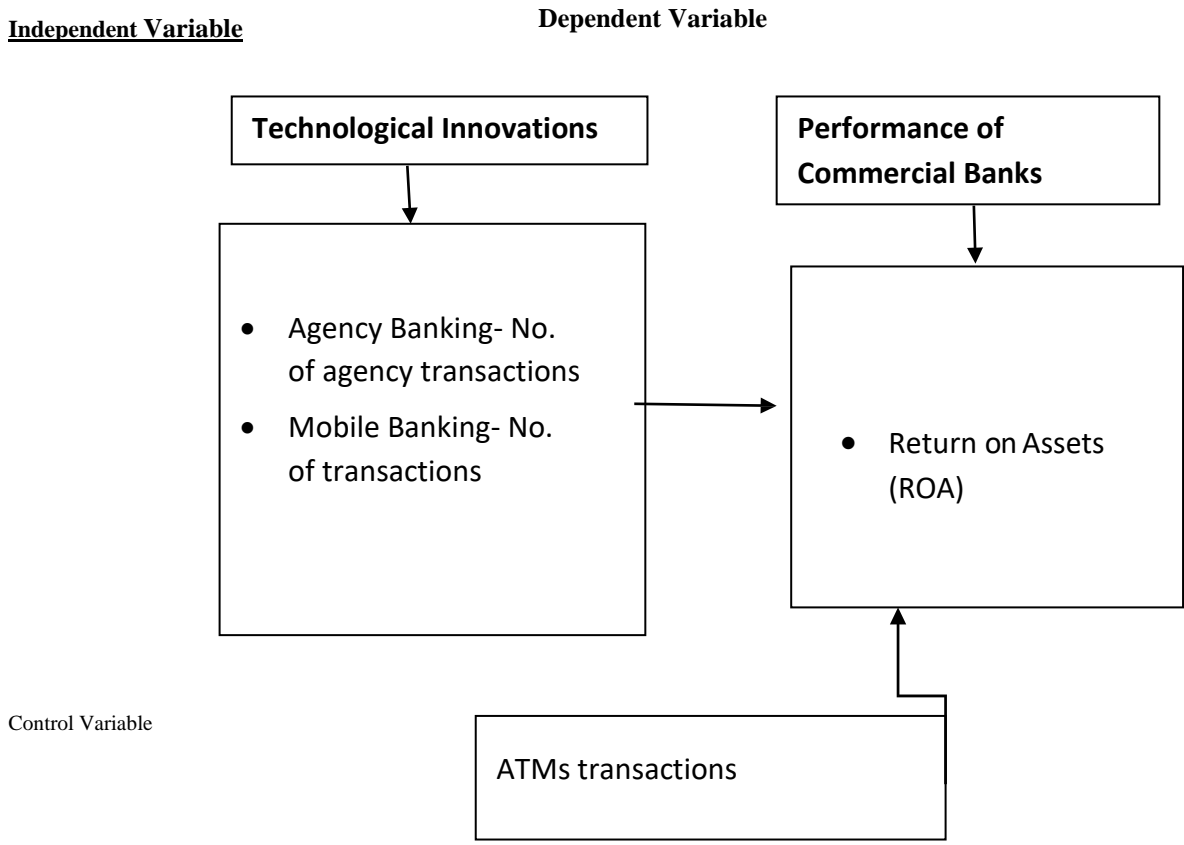


Figure 2. 1: Conceptual Framework

CHAPTER THREE: METHODOLOGY

3.1 Introduction

Chapter three describes the methodological framework on which the study was based. It starts by stating the research design that was used in developing the research body, the population to be targeted, sampling procedures, sample determination and methods, and ethical considerations. Furthermore, it also defines the data collection and analysis techniques that formed the basic foundation of this research study.

3.2 Research Design

A research design is usually a guiding principle that gives a fundamental framework under which any research project is anchored on. More often, it forms the basic foundation of developing the conceptual framework, data collection, and analysis through the formulation of a philosophical framework as well as the practicality of any research article (Orotho & Kombo, 2008). As a result, this study employed the descriptive research approach in developing the conceptual framework, data collection as well as analysis. This approach was used to determine how various commercial banks in Kenya have used different technological innovations in creating a competitive edge and to remain a float by increasing their financial performance especially during this technology era.

3.3 Population of the Study

A study population is normally considered as objects or a group of individuals that have homogeneous traits (Mugenda & Mugenda, 2003). As such, the study population of the study comprised all the 43 commercial banks that were registered in Kenya as per the data from CBK from 2011. Since the study incorporated all the 43 registered commercial banks, there was no sampling required.

3.4 Data Collection

The article used the aggregated secondary data from all the 43 registered commercial banks in Kenya for a period of 10 years from 2011 to 2020. For the technological innovations, the total number of

transactions from the ATMs, agency banking and mobile banking were collected. For financial performance, net incomes and total asset values were collected. The net incomes and total assets were then used to calculate the aggregated return on assets for the commercial banks for the stated period. These data were extracted from the financial reports posted by the individual firms on their websites and also from the bank supervision annual reports by the CBK on the CBK website and KBA. This saved time and also provided an opportunity for accurate data; thus, minimal errors were reported.

3.5 Data Analysis and Presentation

The study employed the regression analysis technique through the use of excel to establish the relationship between the tremendous uptake of technological innovations and the financial performance of commercial banks in Kenya from 2011 to 2020. According to Terry (2007), regression analysis is usually a sure model for hypothesis testing between the dependent and independent variables. Therefore, in this study, the model was represented in a mathematical model as follows:

$$ROA = \alpha_0 + \alpha_1 A_1 + \alpha_2 M_2 + \alpha_3 ATM_3 \text{ where,}$$

ROA - Return on Assets α - Constant Value

a_1, a_2, a_3 - Coefficients

A- number of agency banking done on the PDQ machines

M - mobile banking

ATM - number of transactions done on the ATMs machines

3.6 Testing the Hypothesis

The research paper used F-tests, t-tests, and correlation to investigate whether there was a connection between technological innovations and the financial developments of commercial banks in Kenya. These tools were used to formulate the necessary in decision-making and which was the basis of the research paper. The correlation analysis was used to inaugurate the relationship between the two variables.

Moreover, the t-test was used to test the significance of the derived hypothesis, while the F-test was used to measure the variability between the study variables. This is what formed the foundation for recommendation and conclusion of this research work.

CHAPTER FOUR: RESULTS AND FINDINGS

4.1 Introduction

This chapter provides the results and findings of the project from the aggregated secondary data collected for all the 43 registered commercial banks in Kenya from different websites including CBK website, individual bank website and Bankers Association of Kenya website. The data collected included the aggregated mobile transactions, ATMs transactions and Agency transactions for the independent variable. The aggregated net incomes before tax and the total assets were collected for the depended variable. These data were the collated on the data collections sheets for easy analysis as described below.

4.2 Descriptive Results

Using the aggregated net comprehensive income before tax and the total assets, the return on assets which is a measure of the banking performance was calculated.

Return on Assets = Net comprehensive Incomes/ Aggregated total assets

Table 4. 1 Calculated Return on Assets

RETURN ON ASSETS										
	YEARS									
Years	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Net Income before tax (Profit before tax) (Millions)	89.50	106,996.00	124,547.00	141,145.00	132,280.00	147,445.00	133,196.00	152,700.41	159,071.93	112,145.42
Total Assets (Millions)	2,021	2,289,649	2,656,639	3,199,396	3,423,835	3,695,943	4,002,741	4,408,593	4,811,581	5,405,746
Return on total Assets	4.43%	4.67%	4.69%	4.41%	3.86%	3.99%	3.33%	3.46%	3.31%	2.07%

Table 4. 2 ROA, Aggregated Mobile, Agency and ATMs Transactions

	Y	X1	X2	X3
Year	ROA (Percentages)	Agency Transactions	Mobile Transactions	ATM transactions
2011	4.43%	8.76	18.00	942
2012	4.67%	30.01	55.96	935
2013	4.69%	42.06	89.00	1,053

2014	4.41%	58.00	102.36	1,005
2015	3.86%	79.89	118.50	1,096
2016	3.99%	104.19	129.20	1,239
2017	3.33%	139.75	139.93	1,341
2018	3.46%	157.00	155.77	1,226
2019	3.31%	163.00	154.99	1,209
2020	2.07%	119.00	181.30	1,202

4.3 Descriptive Statistics

The research employed various diagnostic analysis on the descriptive statistics with the view of establishing the significant correlations that exists between the financial progression of commercial banks and the technological innovations employed on the business model. Also, the tests were to ascertain the significance of the whole multiple regression analysis in explaining the relationships. Correlation analysis, t-tests, and F-tests were all used.

4.3.1 Correlation Analysis

Table 4. 3 Correlation Analysis Results

	<i>ROA (Percentages)</i>	<i>Agency Transactions</i>	<i>Mobile Transactions</i>	<i>ATM transactions</i>
ROA (Percentages)	1.0000			
Agency Transactions	0.7407 0.0000	1.0000 0.0000		
Mobile Transactions	0.8276 0.0000	0.9011 0.0000	1.0000 0.0000	
ATM transactions	0.7013 0.0000	0.8988 0.0000	0.8367 0.0000	1.0000 0.0000

From the correlation results above, it was established that the overall financial performance of the commercial banks from the aggregated results showed a strongly positive correlation with the aggregated mobile transactions, ATMs transactions and the Agency transactions. The financial performance of the commercial banks showed a positive factor of 0.7407 indicating that the correlation can be established at 74.07%. This was also true with the mobile banking transactions with 82.76% correlation. Also, there

was a strong correlation established between the ATMs transactions and the financial performance of the commercial banks with a correlation factor of 0.7013 as in the table 4.3 above.

4.3.2 Multiple Regression Analysis

The multiple regression analysis was also conducted to establish the significance of the three variables (ATMs, Mobile and Agency transactions) in explaining the overall relationship of the regression analysis.

Table 4. 4 Descriptive output

<i>Regression Statistics</i>	
Multiple R	0.8282
R Square	0.6859
Adjusted R Square	0.5289
Standard Error	0.0056
Observations	10

<i>ANOVA</i>					
	<i>Df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	3	0.0004	0.0001	4.3682	0.0592
Residual	6	0.0002	0.0000		
Total	9	0.000591278			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.057335	0.028284	2.02710	0.0890	-0.011874	0.126544	0.011874	0.126544
Agency Transactions	0.000012	0.000099	0.11786	0.9100	-0.000230	0.000253	0.000230	0.000253
Mobile Transactions	0.000137	0.000087	1.57999	0.1651	-0.000350	0.000075	0.000350	0.000075
ATM transactions	0.000004	0.000031	0.12778	0.9024	-0.000079	0.000071	0.000079	0.000071

From the results shown in table 4.4, the F-test value was established to be 4.3682 with a p-value of 0.0592. Because the p-value is almost equal to the normal p-value of 0.05 at 95% confidence level, we reject the null hypothesis. Therefore, the whole regression analysis is relatively significant in explaining the relationship between the dependent and the independent variable. Therefore, ATMs transactions,

Mobile transactions and Agency banking transactions as measures of technological innovations have significant relationship on the overall financial performance of commercial banks.

4.4 Test for Hypothesis

Hypothesis One

H₀ The Agency banking has no impact on the financial performance of commercial banks in Kenya

Table 4. 5 Financial Performance and Agency Banking

<i>Regression Statistics</i>	
Multiple R	0.7407
R Square	0.5487
Adjusted R Square	0.4923
Standard Error	0.0058
Observations	10

<i>ANOVA</i>					
	<i>Df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.0003	0.0003	9.7268	0.0143
Residual	8	0.0003	0.0000		
Total	9	0.0006			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.04812	0.0037	13.147	0.0000	0.0397	0.0566	0.0397	0.0566
Agency Transactions	0.000110	0.0000	3.1188	0.0143	0.0002	0.0000	0.0002	0.0000

From the ANOVA analysis above, it was established that there is a positive relationship between the agency banking and the financial performance of commercial banks. The indicative t-test from the analysis is 3.1188 with a p-value of 0.0143. This p-value was less than the conceptual p-value of 0.05 (p-value; $0.0143 < 0.05$). Therefore, agency banking positively determines the overall financial performance of the commercial banks. Furthermore, from the findings, the R² value is 54.87%. This meant that any change in the agency banking only has a variation of 45.13%. Therefore, null hypothesis was rejected and that the agency banking has significant impact on the financial performance of commercial banks in

Kenya. Hence, the study established a linear equation between agency banking and the financial performance.

$$Y = 48117.90 + 109.70X_1$$

This means that when ATMs transactions are held constant, any single change in the agency banking increases the overall financial performance by 109.70 units.

Hypothesis Two

H₀ Mobile banking has no impact on the financial performance of commercial banks in Kenya

Table 4. 6 Financial Performance and Mobile Banking

<i>Regression Statistics</i>	
Multiple R	0.8276
R Square	0.6850
Adjusted R Square	0.6456
Standard Error	0.0048
Observations	10

ANOVA					
	<i>Df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.0004	0.0004	17.393	0.0031
Residual	8	0.0002	0.0000		
Total	9	0.0006			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.05368	0.0040	13.393	0.0000	0.0444	0.0629	0.0444	0.0629
Mobile Transactions	0.000135	0.0000	4.1705	0.0031	0.0002	0.0001	0.0002	0.0001

From the above analysis table, it was established that mobile banking has a positive influence on the overall financial performance of the commercial banks in Kenya. The findings showed that t-test value of 4.1705 with a p-value of 0.0031. This p-value is less than the conventional p-value of 0.05 (p=0.0031<0.05). As such, the mobile banking can directly be attributed to the financial performance of

the banks hence the null hypothesis is rejected. This was also backed up by the R^2 which was found to be 68.50% hence the variation is only 31.5%. Using this finding, an equation between mobile banking and performance was established.

$$Y = 53684.69 + 135X_2$$

This means that if ATMs transactions are kept constant, any unit change in the mobile banking has a significant change of 135 units on the financial performance of commercial banks in Kenya.

Hypothesis Three

H_0 The ATMs transactions have no impact on the financial performance of commercial banks in Kenya

Table 4. 7 Financial Performance and ATMs Transactions

<i>Regression Statistics</i>	
Multiple R	0.7013
R Square	0.4918
Adjusted R Square	0.4283
Standard Error	0.0061
Observations	10

ANOVA					
	<i>Df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.0003	0.0003	7.7417	0.0238
Residual	8	0.0003	0.0004		
Total	9	0.000591278			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.08435	0.0167	5.053	0.0010	0.0459	0.1228	0.0459	0.1228
ATM transactions	0.0000410	0.0000	2.782	0.0238	0.0001	0.0000	0.0001	0.0000

The results in the table 4.7, t-value of 2.7824 resulted into a p-value of 0.0238 and which was less than the conventional p-value of 0.05. This meant that the null hypothesis was rejected and the ATMs

transactions expressly explained the significant financial performance of commercial banks. However, the variations caused by any unit change was huge with R^2 of 48.92%. From this, however, the equation linking the ATMs transactions as a control variable. When agency banking and mobile banking are kept constant, any unit change in the ATMs transactions has a positive change of 41.01 units on the overall financial performance of commercial banks.

$$Y = 84352.19 + 41.01X_3$$

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter outlines an overview of the project findings and a discussion of the possible recommendations that underlines the research work. It also provides some of the major areas of limitation that were encountered during the research period. Thereafter, the identification of some of the grey areas in the study that requires further analysis and research.

5.2 Summary of findings and conclusion

As outlined from the discussions, the study established that the overall financial performance of commercial banks in Kenya can be determined by the technological innovations applied. Both mobile banking and agency banking showed a very positive relationship and that any change in the aforementioned variables have a resultant positive growth in the financial performance. Any unit increase in the agency, mobile and ATMs causes a positive increase in the financial performance of 109.70, 135, and 41.01 units respectively. Therefore, the study established that despite other variables like corporate governance and operational costs, well execution and implementation of technological innovations has a significant impact on the overall financial performance of commercial banks in Kenya.

5.3 Recommendations

From the study, it was evidently established that indeed financial performance of commercial banks in Kenya can be anchored on the strong technological innovations implemented. As such, it is essential that every commercial bank need to devote reasonable time, effort, and expertise in its technological advancement. This is not limited to the budget that must be increase to cope with the increasing cost of acquiring new technology and research thereof. This increase innovation should be seen in the areas of agency banking, mobile networks, as well as increasing the ATMs networks. Furthermore, with the increasing globalization, every commercial bank need to be early adopters of the various technological

aspect in the market. This reduces the chances of such business have a competitive edge in the already competitive financial market.

5.4 Limitations of the study

In conducting this study, there were three major limitations that were encountered. First, it was noticed that some of the banks merged in the course of the study period such as National Bank and CBA Bank. Secondly, some of the banks such as Chase bank, Imperial bank, and Charterhouse bank got liquidated and no longer existed during the study period. These two limitations, however, were mitigated by having a wider study period and used the aggregated data leaving the unclear data out of the study. This ensured that such effects are catered for. Thirdly, with the emergence of Covid-19, the financial sector not only in Kenya but globally got affected. However, to ensure the limitation is mitigated, the study had a long study period from 2011 to 2020 thus ensuring that only 2020 would be subjected to Covid-19 impacts but which was negligible as it is covered by the 9 years of study period before Covid-19.

5.5 Suggestions for further research

According to the results of the research, it was evident that technological innovation has a great impact on the financial performance of commercial banks in Kenya. However, the uptake of the new technological innovations by different commercial banks has not been smooth. As such, this study presents a favorable platform for further study especially on the possible factors that hinder smooth uptake of technological innovations and expertise in the operations of commercial banks in Kenya.

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APPENDICES

Table 5. 1 List of Registered Commercial Banks in Kenya

List of Registered Commercial banks in Kenya
<ol style="list-style-type: none">1. Standard Chartered2. Sterling Investment Bank3. Suntra Investment Bank Ltd4. Cooperative Bank5. Standard Investment Bank6. Prime Bank7. Paramount Bank8. NCBA Bank9. Oriental Commercial Bank Ltd.10. ABC Bank11. National Bank12. Sidian Bank13. UAB Kenya

14. Kenya Post Office Savings Bank
15. KCB
16. Investments & Mortgages Bank Limited – I&M Bank
17. Imperial Bank Limited
18. Housing Finance
19. Guardian Bank Ltd.
20. Giro Commercial Bank Ltd
21. Fina Bank
22. Fidelity Bank
23. Faida Investment Bank – FIB
24. Equity Bank
25. Equatorial Investment Bank
26. Equatorial Commercial Bank Limited
27. Dyer & Blair Investment Bank
28. Dubai Bank Kenya Ltd
29. Dry Associates Limited
30. Development Bank Of Kenya Ltd
31. Co-operative Bank
32. Consolidated Bank
33. Commercial Bank of Africa
34. Citibank N A
35. Chase Bank
36. CFC Stanbic Bank Limited
37. Central Bank of Kenya
38. Bank Of Baroda (Kenya) Ltd.
39. Bank of Africa Kenya Ltd
40. Afrika Investment Bank
41. African Development Bank Group
42. African Banking Corporation

Table 5. 2 Data Collected

<u>Variable</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>
Variable 1: Agency Banking										
For the entire commercial banks										
Amounts (Millions)	8.76	30.01	42.06	58.00	79.89	104.19	139.75	157.00	163.00	119.00
Variable 2: Mobile banking transactions										
Amounts (Millions)	18.00	55.96	89.00	102.36	118.50	129.20	139.93	155.77	154.99	181.30
Variable 3: Number of transactions through ATMs (Assumption=										
Years	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>
No of ATMs	2,205	2,381	2,487	2,613	2,718	2,656	2,825	2,529	2,459	2,412
No of transactions per years	427,039	392,863	423,200	384,708	403,288	466,462	474,794	484,814	491,535	498,350
Total Number of transactions	<u>941,620,995</u>	<u>935,406,803</u>	<u>1,052,498,400</u>	<u>1,005,242,004</u>	<u>1,096,136,784</u>	<u>1,238,923,072</u>	<u>1,341,293,050</u>	<u>1,226,094,606</u>	<u>1,208,683,999</u>	<u>1,202,019,621</u>
Total transactions (Millions)	942	935	1,052	1,005	1,096	1,239	1,341	1,226	1,209	1,202

Depende**nt****Variable****Variable 1:****Return on****Assets**

<u>Years</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>	<u>2015</u>	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>
Net Income before Tax (Million)	89.50	106,9 96.00	124,54 7.00	141,14 5.00	132,28 0.00	147,44 5.00	133,19 6.00	152,70 0.41	159,07 1.93	112,14 5.42
Total Assets (Millions)	<u>2,020</u> <u>.80</u>	<u>2,289,</u> <u>649.0</u>	<u>2,656,</u> <u>639.00</u>	<u>3,199,</u> <u>396.00</u>	<u>3,423,</u> <u>835.00</u>	<u>3,695,</u> <u>943.00</u>	<u>4,002,</u> <u>741.00</u>	<u>4,408,</u> <u>593.13</u>	<u>4,811,5</u> <u>80.84</u>	<u>5,405,7</u> <u>46.00</u>
ROA	<u>4.43</u> <u>%</u>	<u>4.67</u> <u>%</u>	<u>4.69%</u>	<u>4.41%</u>	<u>3.86%</u>	<u>3.99%</u>	<u>3.33%</u>	<u>3.46%</u>	<u>3.31%</u>	<u>2.07%</u>