

**EFFECT OF FINANCIAL TECHNOLOGY ON
FINANCIAL DEEPENING IN KENYA**

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**A RESEARCH PROJECT SUBMITTED IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD
OF THE DEGREE OF MASTER OF SCIENCE IN FINANCE,
FACULTY OF BUSINESS AND MANAGEMENT SCIENCES,
UNIVERSITY OF NAIROBI**

NOVEMBER, 2022

DECLARATION

I, the undersigned, declare that this is my original work and has not been presented to any institution or university other than the University of Nairobi for examination.

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



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ACKNOWLEDGEMENT

This research is a culmination of a journey of academic passion and fulfillment of a dream. I am grateful to God Almighty for continued grace and favor. I sincerely thank my supervisor, Dr. JohnBosco Kisimbii for his guidance and direction in my scholarly journey. I also want to express my gratitude to my family, friends, colleagues, and everyone who played a part in supporting me to achieve this milestone.

DEDICATION

This research project is dedicated to my family members for their unwavering support. Special appreciation to my dad, Patrick Ongaga for always encouraging me and pushing me to success. To my siblings Angeline, Falex, Moureen and Lister I am grateful for the support offered.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
ATM	Automated Teller Machine
CBK	Central Bank of Kenya
GDP	Gross Domestic Product
KNBS	Kenya National Bureau of Standards
MFI	Micro Finance Institution
SME	Small and Medium Enterprises
SPSS	Statistical Package for Social Sciences
VIF	Variance Inflation Factors

ABSTRACT

The importance of financial deepening cannot be over emphasized due to its contribution to economic development. Financial deepening enhances the mobilization, pooling, and channeling of the saving into a productive capital pool that enhances economic development. Some scholars believe that the application of fintech has improved financial deepening through financial innovation and technology spillover, reducing service costs and information asymmetry. Some others believe that the development of fintech has spawned many enterprises, new service models, and new financial products. However, it has also caused a certain negative – even subversive – impact, on the financial system, hindering financial deepening. The objective of this research was to determine the effect of financial technology on Kenya’s financial deepening. The study was based on disruptive innovation theory and supported by financial intermediation theory as well as diffusion of innovation theory. The independent variable was financial technology measured using the number of transactions through mobile banking, internet banking, agency banking and Mpesa while the control variables were interest rate and inflation. The dependent variable that the research attempted to explain was the financial deepening in Kenya. The data was collected on a quarterly basis over a period of 10 years (from January 2012 to December 2021). A descriptive research approach was employed in the research, with a multivariate regression model used to examine the connection between the study variables. The study's findings yielded an R-square value of 0.770, indicating that the chosen independent variables could explain 77 percent of the variance in Kenya’s financial deepening, while the other 23 percent was due to other factors not investigated in this study. The F statistic was significant at a 5% level with a $p=0.000$. This suggests that the model was adequate for explaining financial deepening in Kenya. Further, the findings demonstrated that mobile banking; internet banking and Mpesa had a significant positive impact on financial deepening as indicated by positive coefficients and p values less than 0.05. Inflation was established to possess negative and considerable outcome on financial deepening, as shown from the negative coefficient and a p value less than 0.05 while agency banking and interest rate were found not to have a significant effect. The research recommends the need for policy makers to create a conducive environment for development of more fintech innovations while at the same time ensuring the safety of the existing ones as this contributes to a rise in financial deepening. The study also recommends that there is need to come up with effective measures of managing inflation levels as high inflation has an adverse effect on financial deepening. The study recommends the need for future researchers to conduct a study for a longer period of time to capture the effects of economic cycles.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Since the global financial crisis, the continuous development of computer technology, internet technology, and biometrics, and the emergence of new scientific and technological achievements such as artificial intelligence, cloud computing, big data, Internet of things, and blockchain have significantly reduced social costs. The development of fintech has been a product of a consensus between international financial organizations, financial regulatory authorities, and academia (Misati, Osoro, Odongo & Abdul, 2022). Some scholars believe that the application of fintech has improved financial deepening through financial innovation and technology spillover, reducing service costs and information asymmetry (Wu, Bai & Chen, 2022). Some others believe that the development of fintech has spawned many enterprises, new service models, and new financial products. However, it has also caused a certain negative – even subversive – impact, on the financial system, hindering financial deepening (Bin & Xiping, 2021).

This study was anchored on disruptive innovation theory and supported by financial intermediation theory as well as diffusion of innovation theory. Disruptive innovation theory by Christensen (1997) is the anchor theory and it is based on the idea that innovations can transform a prevailing market by improving access, ease, cost efficiency, as well as market easiness where items as well as services are expensive. The theory holds that use of disruptive technology is crucial in attaining intended financial deepening. Financial intermediation theory by Diamond (1984) observes that financial institutions tend to develop innovative products meeting the differing needs of clients. In the process, they are capable to reach more customers leading to financial deepening. According to Rogers (1995), the method by which a radical concept spreads through a particular social system depends on the use of a particular preference channel.

Fintech has conceived digital financial products which has enhanced access to financial banking services. Subsequently, there has been a surge in fintech innovations in the emerging markets and despite significant progress in their adoption, there are still enormous swathes of global population with limited or no access to formal finance.

These financial innovations have altered traditional banking services and its ultimate value addition to financial services cannot be ignored (Mwai, 2021). In Kenya, formal financial deepening has gone up from 75.3% in 2016 to 84.6% in 2021 (Fin Access, 2021). This shows that Kenya is making a remarkable progress in increasing financial deepening. Financial technology has widely been seen as the emergence of new financial products such as digital loans which has been brought about by the growth and development of fintech companies.

1.1.1 Financial Technology

Any innovation in technology that improves the efficiency of the financial sector is considered part of financial technology (Banna, Mia, Nourani & Yarovaya, 2022). Financial technology is providing a wide range of technology solutions to improve efficiency, speed of reaction, and customer satisfaction (Demir, Pesqué-Cela, Altunbas & Murinde, 2022). The financial industry has been impacted by the rise of mobile banking, the use of distributed ledger technology to facilitate faster transactions, the proliferation of cryptocurrencies, the proliferation of mobile lending to individuals and small market enterprises, and the use of data analytics to better understand consumers' saving habits, credit histories, spending habits, and tax obligations all of which are aspects of financial technology (Liu, & Walheer, 2022). In Kenya, some of the financial technologies adopted include mobile banking, internet banking, ATMs, agency banking, Mpesa, digital lending among others (FinAccess, 2021).

Fintech has been used as a mechanism to an end though not the end itself. Globalization, volatility in client needs, competitiveness, and technical improvements are examples of external environment dynamics that have produced ongoing environmental upheavals and necessitate more innovations from executives (Banna et al., 2022). As a growth technique, fintech aims to break into modern markets, share market increase, as well as provide a company a competitive advantage via employing strategies that are diverse from the competition. The rising competitiveness in international marketplaces has compelled firms to acknowledge the fintech essence as the business environment changes and traditional services as well as products lose value (Muthengi, 2022).

Fintech has been operationalized before in various ways. Fintech has been operationalized before in terms of mobile banking, internet banking, ATMs, agency banking among others (Sindani, Muturi & Ngumi, 2019). Fintech has also been operationalized as an index comprising of the value of digital transactions to GDP in a given period (Koki, 2018). This study attempted to quantify the level of fintech usage, as defined by the total value of transactions carried out via agency banking, internet banking, mobile banking and M-pesa. This measure has been used before by Abdulkadir (2019).

1.1.2 Financial Deepening

According to World Bank (2021), financial deepening is a process that involves an increase in the provision of financial services by supplying financial resources to the economy. Roubini and Bilodeau (2018) holds that financial deepening is the designing of policies, infrastructural factors, and institutions that enable broad access to monetary and financial benefits as well as monetary intermediation that is effective. Mehrotra and Yetman (2018) defined this as the enhancement of the financial services that are customized to serve all societal hence increasing the accessibility and the availability of financial services in the economy. The current study will adopt the definition by the World Bank (2021).

The importance of financial deepening is in the public knowledge in development policy and is considered the first thing in many countries. This knowledge enables the productive resources to be allocated efficiently, creating access to the appropriate financial services thus reducing the growth of informal credit sources. Financial deepening enhances the mobilization, pooling, and channeling of the saving into a productive capital pool that enhances human development (Rahman & Mustafa, 2018). It is widely accepted that financial deepening is important for long-term economic and human development (Adan, 2017).

Financial deepening has been measured using several variables. Robinson (2016) used stock market capitalization to assess financial deepening in India. Roubini and Bilodeau (2018) utilized the capitalization rate as a representative of financial deepening in his

study. Mehrotra and Yetman (2018) measured financial deepening in credit terms as the percentage of credit to the private sector to GDP. The current study measured financial deepening using the issued credit to the private sector by financial organizations, such as banks then dividing it by the GDP due to its wider applicability in previous literature.

1.1.3 Financial Technology and Financial Deepening

The impact of fintech on financial deepening is generally analyzed from the perspective of disruptive innovation and technology spillover theories. In the initial stages, the purpose of fintech is to bring about disruptive innovation. Through innovation, it introduces simpler and more customer-oriented products and services to serve the ‘long-tail customers’ who are not effectively covered by traditional financial products. Gradually, it replaces the dominant traditional institutions and products (Wu et al., 2022).

Yunda, Wei and Huadong (2020) believe that the positive spillover of bank fintech investment on productivity is not obvious and involves a productivity paradox to an extent. As traditional financial institutions gradually increase investment in fintech, the integration of emerging technologies and traditional financial services increases, which better reflects the technology spillover effect and improves the efficiency of financial institutions. The impact of fintech on the financial industry differs according to market characteristics and stages of fintech development (Stankevičienė & Kabulova, 2022).

Due to the smoothing of consumption, increased fintech enables households to have greater access to borrowing and savings products (Mehotra & Yetman, 2018). Among the anticipated advantages of fintech as per Rasheed, Law, Chin and Habibullah, (2016) is that widespread credit and saving opportunities access would foster economies of scale that will foster long-term financial deepening. In order to encourage sustainable economic and social growth, reduce poverty and unemployment, and stabilize the financial system, access to and use of these services are essential (Zins & Weill, 2016).

1.1.4 Financial Technology and Financial Deepening in Kenya

In recent years, technological changes have had a significant impact on Kenya's financial services sector. Data from CBK shows that the value of mobile transactions has increased at a rate of 66.3% at inception in 2007, from Kshs 14.8 billion of transaction volume to Kshs 5.2 trillion of transaction volume in 2021. This highlights the fact that mobile money is most substantial distinguishingly. The popularity of online banking has also grown, and most banks are now shifting their focus from traditional brick and mortar locations to online channels. Digital lending, which has recently revolutionized the market, was partly a reaction to the slow expansion of private sector credit that followed the limiting of interest rates on loans provided by banks (Mwai, 2021).

In terms of financial deepening in Kenya, a report by the World Bank (2021) shows the country's financial sector has grown significantly in terms of both complexity and size thus boosting the overall economic growth to a great extent. The sector constitutes mainly insurance, banking, capital markets, savings and credit cooperatives as well as pensions. Foreign exchange bureaus, Microfinance institutions, money remittances companies, and finance development institutions are other major players. Resolution organizations and safety nets also exist to incorporate the compensation funds for; the policyholders of the insurance industry, the Kenya deposits insurance as well as the commercial microfinance bank. Capital markets incorporate the investor compensation fund.

1.2 Research Problem

The importance of financial deepening cannot be over emphasized due to its contribution to economic development. Financial deepening enhances the mobilization, pooling, and channeling of the saving into a productive capital pool that enhances economic development (Rahman & Mustafa, 2018). Some scholars believe that the application of fintech has improved financial deepening through financial innovation and technology spillover, reducing service costs and information asymmetry (Wu, Bai & Chen, 2022). Some others believe that the development of fintech has spawned many enterprises, new service models, and new financial products. However, it has also

caused a certain negative – even subversive – impact, on the financial system, hindering financial deepening (Bin & Xiping, 2021).

The financial sector in Kenya plays a crucial role in economic growth and especially towards achievement of Vision 2030. Financial institutions, particularly banks in Kenya, have embraced enhanced digitization with fintech at the forefront in an effort to increase their competitive edge. This is done in order to expand their network, cut personnel costs, compete favourably with their peers, and boost organizational performance (Mwai, 2021). In Kenya, formal financial deepening has gone up from 75.3% in 2016 to 84.6% in 2021 (Fin Access, 2021). This shows that Kenya is making a remarkable progress in increasing financial deepening. Financial technology has widely been seen as the emergence of new financial products such as digital loans which has been brought about by the growth and development of fintech companies.

Despite evidence of international research in this area, there still exists research gaps that the current study intends to fill. Banna, Mia, Nourani and Yarovaya (2022) focused on the effect of fintech-based financial deepening and Sub-Saharan Africa micro finance institution risk-taking. The study revealed that higher involvement in fintech solutions is associated with lower risk-taking of MFIs. Wu et al. (2022) empirically tested the relationship between fintech development and financial efficiency. The results show that technology spillover theory can adequately explain the impact of financial technology on financial efficiency and that there is a U-shaped nonlinear relationship between fintech development and financial efficiency. Liu and Walheer (2022) adopt a composite index approach for establishing the interrelationship between fintech, financial deepening and economic development. The empirical study reveals key trends that can be used to comprehend variations in financial deepening and create new policy initiatives. Since each of these experiments was carried out in a different environment, the results cannot be extrapolated to the current scenario.

Locally, Misati, Osoro, Odongo and Abdul (2022) evaluated financial innovation impact on financial deepening and economic growth in Kenya. The results reveal that mobile transactions in value, the number of mobile agents and internet have significant

positive impact on financial deepening. The study reveals a conceptual gap as some aspects of fintech such as agency banking and Mpesa were not considered. Muthengi (2022) sought to find out how financial technology and financial inclusion affect SMEs in Kenya's Kabati market. This research offers a conceptual gap as it focused on financial inclusion leaving a gap on deepening. According to the research conclusions, financial technology significantly affects financial inclusion. Mwai (2021) sought to establish the effect financial innovations have on financial deepening of commercial banks in Kenya. Positive significant relationship between mobile phone banking, automated teller machine, online banking, agency banking and financial deepening were reported. The study did not take into account Mpesa hence a conceptual gap.

This study was motivated by the increased adoption of fintech. Fintech is expected to enhance financial deepening. In spite previous studies in the area, there exist research gaps. First, most of the studies conducted locally have operationalized financial technology in diverse ways. This presents conceptual gaps that the current study intended to fill. There are also methodological gaps that arise from previous studies conducted locally; most of them were conducted for a short period of time (mostly five years) which might not be adequate to capture the effect of financial technology on financial deepening. Further, most of the local studies have relied on primary data while the current study made use of secondary data to complement the findings. The current research was based on these gaps and attempts to answering the research question; how does fintech influence financial deepening in Kenya?

1.3 Research Objective

The objective of this study was to determine the effect of financial technology on financial deepening in Kenya.

1.4 Value of the Study

This research results will contribute to the existing theoretical and empirical literature on fintech and financial deepening. The results will also aid in theory development because they will shed light on the limitations and applicability of the existing theories

to the study variables. Based on the recommendations and suggestions for additional study, additional investigations may potentially be conducted.

The research conclusions will assist investors opting investing in the population under investigation by offering information on the risk-return tradeoffs present in those organizations and their effect on profitability. The government and regulator CBK may find the research's findings useful in developing regulations for the population under investigation.

The conclusions will aid investors as well as practitioners comprehend the link between the two variables, that is important for ensuring strong management team with diverse viewpoints and competences streamlining operations as well as managing fintech, as well as for building confidence among corporate stakeholders, that will eventually optimize financial deepening.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This section includes a theoretical overview and discussion of the theories that are pertinent to the topic, as well as discussion of any relevant or related empirical studies. The chapter also shows the conceptual framework that predicts the relationships between the variables, and it concludes with a summary of the literature review.

2.2 Theoretical Framework

This section surveys the theories that underpin the study of fintech and financial deepening. The study reviewed the disruptive innovation theory, financial intermediation theory and diffusion of innovation theory.

2.2.1 Disruptive Innovation Theory

Christensen (1997) pioneered the theory, and it is the anchor theory for the current study. It is based on the idea that innovations can transform a prevailing market by improving access, ease, cost efficiency, as well as market easiness where items as well as services are expensive. Disruptive innovation, according to Christensen (1997), is best pertinent in an unappealing market where new products and services later reshape the market. Comprehending the natural laws that leverage disruptive technologies in new markets as well as products creation is the most effective path to success (Kostoff, Boylan, & Simons, 2004). Other critical concerns include understanding the disruptive technology dynamics or if management will be able to adapt correctly to taking advantage of emerging chances.

Firms begin by focusing on the market's lower end clients (lower tier consumers) by offering goods as well as services which they can afford (Christensen, Baumann, Ruggles, & Sadtler, 2006). Disruptive innovation allows customers to buy products or services which previously they could not afford (Baumann, Ruggles, & Sadtler, 2006). This may not be the situation; there are variables that allow consumers to buy items and services that they could not formerly afford, such as competition and government rules.

According to Kostoff et al. (2004), moreover, the theory posits that enterprises that maintain innovation exclusively target high-end clients attempting to improve their performance. However, this might not always be the situation; the world's most inventive organizations target all types of clients. They can broaden their market segments scope, boost revenue, and improve performance this way. The theory hypothesizes a positive fintech impact on economic growth. Disruptive innovation theory has been critiqued for not offering a solution on how firms should identify technologies that can disrupt industries (Baumann et al., 2006). The theory is relevant to the current study as it holds that technology adoption can enhance performance of firms and essence overall financial deepening.

2.2.2 Financial Intermediation Theory

This theory was proposed by Diamond (1984). The theory plays a central role in the financial intermediation process particularly among banks to moderate information asymmetry that lies between borrowers and lenders; hence their constant interaction assists lenders in producing credit worthy information to borrowers. Information that is provided gives creditors and loan officers a strong incentive in assessing and appraising credit to those that require it. Modern theories state that the business of financial intermediation is pegged on economic imperfections from 1970s with limited contributions (Jappelli & Pagano, 2006). The existence of the intermediaries is based on their ability to lower transaction and information costs from asymmetries (Tripe, 2003).

The biggest criticism of the financial intermediation theory is its inability to give recognition to the role of lenders in the process of risk management (Levine et al., 2000). Scholtens and Van Wensveen (2000) stated that they do not recognize credit risk as an important factor in the financial industry and emphasizing the participation costs concept. They suggested future developments in the financial intermediation theory to understand challenges in the financial sector.

The theory is pertinent to the study because introducing fintech solutions that make it possible for customers to conduct easy and convenient banking operations might

increase financial deepening. Financial intermediaries utilize mobile apps and other digital lending mechanisms that are useful in lowering transactional costs brought about by information asymmetry. They hence play a central role in effective functioning of financial markets. The theory is useful in understanding how fintech and financial deepening relate.

2.2.3 Diffusion of Innovation Theory

The theory was founded by Rogers (1962). An innovation is any newly introduced ideas, practices or item into a social structure whereas, on the contrary, innovation dissemination is the way the new concept is transmitted over a period of time to the social system via a default route. In this regard, this theory attempts to outline how new innovations are accepted and utilized in a social system such as mobile banking and online banking (Clarke, 1995). Rogers (1995) broadened the idea by saying that the study on technological diffusion was insufficient, further explaining that the technology cluster had additional distinctive characteristics that were thought to be fully linked. That is why the advantages and repercussions of embracing or refusing to embrace innovation should be notified to people and societies at large. Rogers (2003) says plainly that interpersonal connections are necessary because dissemination includes a social process.

Robinson (2009) criticizes the theory for taking a dramatically different view of other change theories. It is not about attempting to persuade people to change, though about making progress or re-inventing goods and character, so that they can better suit what the person wants or needs. In this idea, people do not change, but innovations have to adapt to the demands of the people. The invention process takes time, as per Sevcik (2004), and it does not happen immediately. He also believes that the spread of innovation and the opposition to changes has the greatest impact on the process of innovation because it delays it down.

Rogers (2003) argues that the perception of these characteristics by an organization affects the degree of breakthrough technology adoption. If an organization realizes the benefits arising from innovation, these innovations will be taken into account when

additional technologies are available. Innovation is quicker adopted in companies having internet access as well as information technology than in those lacking. The hypothesis is based on the present research, which shows how innovations like innovation are taken up by financial institutions. This theory is relevant study as it helps in understanding how fintech is taken up by financial firms and how this influences financial deepening.

2.3 Determinants of Financial Deepening

This section presents the determinants of financial deepening. It has been globally acknowledged that financial deepening is a multidimensional issue and its improvement necessitates an in-depth and comprehensive approach as outlined below:

2.3.1 Financial Technology

According to Abdulkarim and Ali (2019), fintech is crucial for allocating resources to effective uses and distributing risk to those who can benefit from it, which promotes economic growth. Fintech is anticipated to improve financial deepening, resulting in improved efficiency of the intermediaries (Rasheed, Law, Chin & Habibullah, 2016). Neaime and Gaysset (2018) emphasized generally, fintech has a significant impact in boosting financial deepening of financial companies.

As per Mehotra and Yetman, (2018), with the number of fintech transactions rise, households, borrowing and savings products are made simple for all. Long-term performance of financial institutions is one of the probable beneficiaries of fintech (Rasheed, Law, Chin & Habibullah, 2016). According to Zins and Weill (2016), ensuring that individuals can easily access and make use of these services is essential for promoting social growth and sustainable economic development, reducing poverty, and aiding in the stabilization of the financial sector. In this study, financial technology will be measured as the total number of transactions through Mpesa, agency banking, internet banking, and mobile banking.

2.3.2 Interest Rates

Interest rate significantly influences the pricing of goods and services both regionally and abroad. Money supply in the thrift can significantly impact the levels of interest. For instance, when money is abundant in the economy, the interest rates are more likely to decrease and this will impact how a business functions in the market. This will thereafter boost the market which will become more appealing to outsiders in the country (Barksenius & Rundell, 2012).

Interest rates define the improvement of the economy. As per Barnor (2014), an unforeseen shift in the interest rates affects the investment decisions, where, investors may change their savings arrangements, like shifting to specified profit instruments from the capital market. Khan and Sattar (2014), state that financial development can be affected either negatively or positively by the interest rates depending on the movement. Savings are disheartened by a reduction in interest rates on deposits and increased consumption.

2.3.3 Inflation Rate

Rates of inflation can affect the economy of a country substantially. For instance, during times of price movements and increments, prices of property will increase. Therefore, when inflation in an economy rises, the general cost of goods is likely to increase. This will subsequently affect financial development as the purchasing power declines. Therefore, many investors who engage in the sale of goods and services in the market usually include an allowance for inflation (Biller, 2017).

Higher rates of inflation will translate to prices being higher for consumers slowing down business and thus reducing firms' earnings. High prices also trigger a regime that has a higher interest rate (Hendry, 2016). According to Fama (1998), inflation is likely to be negatively associated with real economic activity, and as a result likely to be positively related to market performance. Thus, growth ought to be related negatively to the expected price level, where short-term interest rates represent the international fisher effect.

2.4 Empirical Review

Both locally and globally studies have established the link between fintech and financial deepening, the objectives, methodology and findings of these studies are discussed.

2.4.1 Global Studies

Wu et al. (2022) analyzed the theoretical mechanism of fintech's impact on financial efficiency and used the text mining method to construct a fintech level index for each province in China. Using interprovincial panel data from 2008 to 2018, the study empirically tested the relationship between fintech development and financial efficiency. The results show that technology spillover theory can adequately explain the impact of financial technology on financial efficiency and that there is a U-shaped nonlinear relationship between fintech development and financial efficiency. Further analysis shows that financial decentralization moderates the marginal effect of fintech on financial efficiency. The effect of fintech on financial efficiency is more significant in regions with greater financial decentralization.

Liu and Walheer (2022) adopt a composite index approach for establishing the interrelationship between fintech, financial deepening and economic development. The study uses demand and supply side data to define financial deepening in terms of three key aspects, and it acknowledges that digital and financial technology are becoming more important in promoting financial deepening. By separating the effects of catching up and environmental change, they then examine how financial deepening has changed over time. With the latter, they can assess the potential for policy interventions and determine if policymakers were successful in fostering an environment that encouraged financial deepening. The empirical study reveals key trends that can be used to comprehend variations in financial deepening and create new policy initiatives.

Banna, Mia, Nourani and Yarovaya (2022) focused on the effect of fintech-based financial deepening and Sub-Saharan Africa micro finance institution risk-taking. They developed a fintech-based financial deepening (FinFI) index. They focused on Sub-Saharan African MFIs with a remarkable and recent development in fintech solutions.

The study revealed that higher involvement in fintech solutions is associated with lower risk-taking of MFIs. Small scale MFIs largely benefited from fintech solutions.

Demir, Pesqué-Cela, Altunbas, and Murinde (2022) used survey data from the Global Findex waves of 2011, 2014, and 2017 to examine the connections between FinTech, financial deepening, and income inequality for a panel of 140 nation. They contend that financial deepening brought about by FinTech affects inequality both directly and indirectly. They use quantile regression analysis to look into whether these effects vary among nations with various income inequality levels. They unearth fresh proof that FinTech's main avenue for reducing income disparity is financial deepening. Additionally, they found that whereas financial deepening considerably lowers inequality at all quantiles of the distribution, these impacts are mostly seen in nations with higher incomes.

Okoye, Omarkhanlen, Okoh, and Isibor (2018) looked at how technology-based financial services affected customer satisfaction in Nigeria. The aim of this research was to determine how much technology has affected customer satisfaction in the Nigerian banking industry. The analysis of the data was based on replies from 120 clients of three Deposit Money Banks in the Nigerian states of Ogun and Lagos. The research assessed time savings, convenience, crime reduction, reliability, risk reduction, and user-friendliness as aspects of bank services. The outcome demonstrated a substantial positive impact of all the aforementioned service elements on customer satisfaction, demonstrating that Nigerians' contentment with electronic-based banking had increased. To support this goal, it is advised that more service locations and user-friendly, customer-focused financial products be made available.

2.4.2 Local Studies

Misati, Osoro, Odongo and Abdul (2022) evaluated financial innovation impact on financial deepening and economic growth in Kenya. They employed autoregressive distributive lag models. Real gross domestic product (GDP) and Credit to private sector indicators were used to measure economic growth and financial depth respectively. The results reveal that mobile transactions in value, the number of mobile agents and

internet have significant positive impact on financial deepening. However, with advancement in mobile and agency banking models, bank branches have negligible contribution to financial deepening. The findings further reveal that the impact of innovations on economic growth is indirect through financial depth channels. They therefore concluded that investment in cost effective innovation will be key determinant of bank's profitability.

Muthengi (2022) sought to find out how financial technology and financial inclusion affect SMEs in Kenya's Kabati market. Descriptive cross-sectional approach was adopted for use in this research whereby stratified random sampling method was applied with 223 enterprises sample size on all merchants and wholesalers SMEs in the Kabati market which had a total population of 502 SMEs. The research utilized questionnaires to gather primary data. Both descriptive and inferential statistics were used to analyze the data. According to the research conclusions, financial technology significantly affects financial inclusion.

Mwai (2021) sought to establish the effect financial innovations have on financial deepening of commercial banks in Kenya. Secondary data was collected from Kenya National Bureau of Statistics, World Bank website, Central Bank of Kenya, published financial accounts statements of all the 43 commercial banking institutions in Kenya, and the Banking survey publications for a time period ranging between 2012 and 2018. Inferential and descriptive statistics were adopted for data analysis. Positive significant relationship between mobile phone banking, automated teller machine, online banking, agency banking and financial deepening were reported. Bank size had positive moderating effect on financial innovations and financial deepening of Commercial banks in Kenya.

Sindani, Muturi, and Ngumi (2019) scrutinized the correlation between the growth of financial distribution channels and the rate of financial deepening in Kenya during a six-year duration, from 2012 to 2017. In particular, the following are some of the objectives of this research: Survey the ways in which the growing popularity of online banking and automated teller machine use in Kenya have contributed to that country's

increasingly high rate of financial deepening. Information gleaned from secondary sources has been compiled for use in further research. The results of the research are presented in frequency tables, percentages, and averages, all of which are derived from the data that was studied. The final categories in this study were generated using descriptive statistics. The functions of the dependent and independent variables were characterized by calculating their means, standard deviations, and variances. This study's results suggest that internet banking in Kenya benefits the financial sector as a whole by increasing productivity and efficiency. In addition, the introduction of ATM banking has helped increase financial deepening in Kenya.

A research by Nzyuko, Jogongo and Kenyanya (2018) assessed the effect of innovations in financial deepening on performance of Kenyan commercial banks. The study covered the period 2010 to 2016. The researchers employed multiple regression method and correlation analysis to analyze data. The research focused on ATM adoption, mobile banking, internet banking and agency banking innovations. The researchers observed that banks have adopted new technologies and alternative delivery channels to reach the unbanked population in Kenya. Using these technologies, they have also reduced operating cost, increased efficiency and improved competitiveness of the institutions. The increased customer base and improved competitiveness of the banks leads to improved performance.

2.5 Conceptual Framework

Displayed in figure 2.1 is the anticipated link between the variables. The predictor variable was fintech given by the natural logarithm of the value of transactions via internet banking, mobile banking, agency banking and Mpesa. The control variables were interest rate given by average lending rate and inflation given by inflation rate. The response variable was financial deepening given by credit to the private sector to GDP.

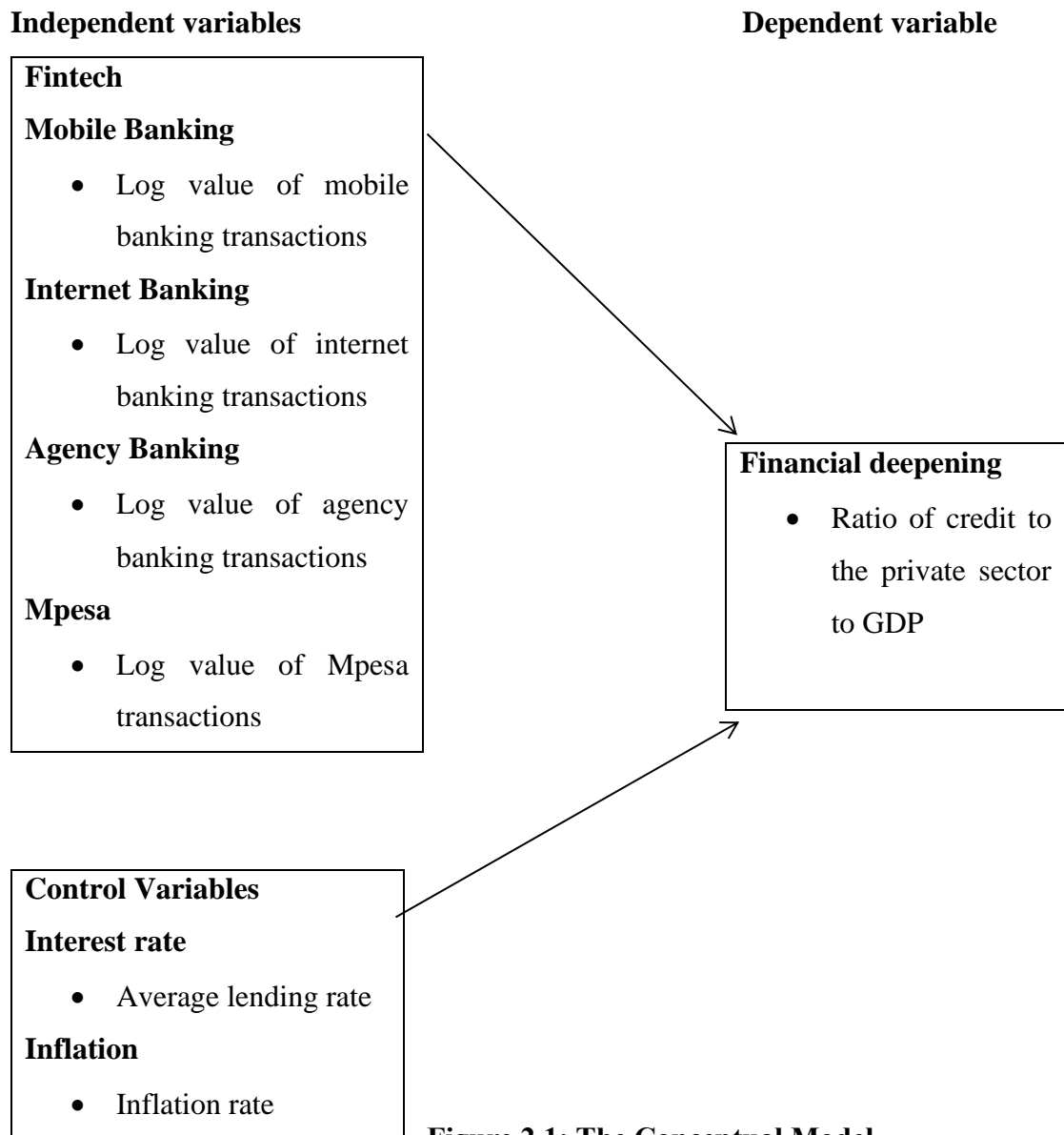


Figure 2.1: The Conceptual Model

Source: Researcher (2022)

2.6 Summary of the Literature Review and Research Gaps

The theoretical reviews demonstrated the forecast link between fintech and financial deepening. Key determinants of financial deepening have been discussed. From the reviewed studies, there is a knowledge gap that needs to be filled. Diverse findings on the relationship between fintech and financial deepening have been drawn from the studies that have been analyzed. Conceptual, contextual, and methodological gaps might be used to explain the disparities from the research.

Conceptually, most of the studies conducted locally have operationalized financial technology in diverse techniques, with the majority selecting for a constrained definition. This presents conceptual gaps that the current study intended to fill. There are also methodological gaps that arise from previous studies conducted locally; most of them were conducted for a short period of time (mostly five years) which might not be adequate to capture the effect of financial technology on financial deepening. The current study considered a 10-year period with data collected quarterly.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

In this chapter, the research design which was used is explained, in addition the approaches and procedures of collecting data are expounded on and finally the chapter explain how the data collected was analysed.

3.2 Research Design

A descriptive design was utilized in determining how fintech and financial deepening in Kenya correlate. This method was ideal since the researcher was particularly interested in the nature of the phenomenon (Khan, 2018). Additionally, it was adequate for describing how the occurrences are related to one another. Additionally, this design validly and precisely represented the variables, providing adequate answers to the research questions (Cooper & Schindler, 2018). This research design has been used before by Misati et al. (2022) and Muthengi (2022).

3.3 Data Collection

Secondary data was used in this research. The secondary data was obtained from the KNBS publications and the CBK website. The quantitative data gathered included value of transactions through Mpesa on a quarterly basis, value of transactions through agency banking outlets in the nation, value of transactions via mobile banking, value of transactions via internet banking, the average bank lending rate and credit to the private sector that was obtained from CBK website. Data on inflation was collected from KNBS on a quarterly basis. The secondary data was gathered for 10-year duration from January 2012 to December 2021 on a quarterly basis. The research period was selected as this is the period that has experienced heightened adoption of fintech.

3.4 Data Analysis

Version 24 of SPSS software was employed for data analysis. The results were presented quantitatively in tables. For each variable, descriptive statistics were used to calculate measures of central tendency as well as dispersion, like mean and standard deviation. Correlation and regression were both used in inferential statistics. The

correlation analysis dealt with variable relationships, and a regression identified the cause and effect of those correlations.

3.4.1 Diagnostic Tests

The linear regression was based on a number of assumptions including no autocorrelation, no or little multi-collinearity, homoscedasticity and multivariate normality. The diagnostic tests performed are outlined in Table 3.1.

Table 3.1: Diagnostic Tests

Test	Meaning	Statistical method	Interpretation	Diagnosis
Autocorrelation	Occurs when the residuals lack independence from each other.	Durbin-Watson statistic	When the test outcomes fall within critical values (1.5<d<2.5) there is no autocorrelation	Correlogram (Auto Correlation Function-ACF plot) Review model specifications
Multicollinearity	How closely related are the independent variables of the study	Variance Inflation Factors (VIF)	VIF less than 10 implies that there is no Multicollinearity	Data that was causing Multicollinearity was adjusted using log transformation
Stationarity	a unit-root test to establish if the data was stationary	Jarque Bera unit root test	A p value less than 0.05 implies that the data is stationary	Robust standard errors were utilized wherever data failed the test.

Normality Test	When linear regression analysis for all variables is multivariate normal	Goodness of fit test Shapiro-Wilk test	Kolmogorov-Smirnov test prob.> 0.05. If the test is not substantial, the distribution is possibly normal.	Data that was not normally distributed was adjusted for using log transformation and non-linear log transformation.
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3.4.2 Analytical Model

The following equation was applicable:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \varepsilon$$

Where: Y = Financial deepening given by total credit issued to the private sector divided by GDP

β_0 = y intercept of the regression equation.

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ = are the regression coefficients

X_1 = Mobile banking given by log value of mobile banking transactions

X_2 = Internet banking given by log value of internet banking transactions

X_3 = Agency banking given by log value of agency banking transactions

X_4 = Mpesa given by log value of Mpesa transactions per quarter

X_5 = Interest rate as measured by the quarterly average lending rate

X_6 = Inflation as measured by the quarterly inflation rate

ε = error term

3.4.3 Tests of Significance

The significance of the overall model and each individual variable was determined via parametric testing. ANOVA was used to figure out the significance of the overall model using the F-test, and a t-test was used to establish the significance of the coefficients.

CHAPTER FOUR: DATA ANALYSIS, RESULTS AND FINDINGS

4.1 Introduction

This chapter presents the analysis, results, and discussions of this research. The main aim of the study was to determine how financial technology influences financial deepening in Kenya. The following sections consist of descriptive statistic, diagnostic test, analysis of correlations, regression, and discussion of results.

4.2 Descriptive Analysis

Descriptive statistics of all variables on which analysis was done are listed in the table below. Quarterly information was gathered and analyzed using SPSS version 24 software during a ten-year period (2012 to 2021).

Table 4.1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Financial deepening	40	.2	.3	.287	.0335
Mobile banking	40	16.08845	17.86842	17.0973090	.41499020
Internet banking	40	6.92952	7.37588	7.2117545	.13803791
Agency banking	40	10.16416	12.32760	11.5620540	.64442336
Mpesa	40	5.1818	6.5191	6.166365	.3405952
Interest rate	40	5.8333	18.0000	9.693665	2.8334484
Inflation	40	4.0333	16.8333	8.074000	3.6064131
Valid N (listwise)	40				

Source: Research Findings (2022)

4.3 Diagnostic Tests

Diagnostic tests were done before even handling the regression model. Normality, Multicollinearity, autocorrelation, and stationarity tests were conducted in the survey.

4.3.1 Normality Test

To see if they had a normally distributed data, the researcher used the Shapiro-Wilk test. If the p-value falls above 0.05, we conclude that there is normal distribution of data

and vice versa. Table 4.2 summarizes the results of the test. Since the data displayed a p value of above 0.05 therefore having a uniform distribution, the researcher adopted the alternative hypothesis. This data was fit to be subjected to tests and analysis like for variance, regression and Pearson’s Correlation analyses.

Table 4.2: Normality Test Results

	Shapiro-Wilk	P-value
Financial deepening	3.591	0.207
Mobile banking	6.305	0.303
Internet banking	4.429	0.405
Agency banking	2.764	0.416
Mpesa	3.154	0.328
Interest rate	4.240	0.401
Inflation	4.146	0.302

Source: Research Findings (2022)

4.3.2 Multicollinearity Test

In a multiple regression model, multicollinearity is displayed whenever predictor variables exhibit a substantial relationship. An event where independent variables have great correlations is unfortunate. Parameters are said to have multicollinearity if they have a perfect linear connection. Outcomes for the test on multicollinearity were displayed in Table 4.3.

Table 4.3: Collinearity Statistics

	Collinearity Statistics	
	Tolerance	VIF
Mobile banking	0.432	2.315
Internet banking	0.511	1.957
Agency banking	0.387	2.584
Mpesa	0.476	2.141
Interest rate	0.685	1.460

Inflation	0.701	1.427
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Source: Research Findings (2022)

VIF value is used where values that fall below 10 are not multi-linear. One condition for multiple regressions to occur is that no strong connection should be evidenced among variables. Given by the outcomes, every VIF variable is below 10 as indicated in table 4.3 which shows that independent variables in the study experience no significant statistical multi-linearity.

4.3.3 Autocorrelation

A serial correlation test established the relationship of error terms for different times. For the research to obtain the desired model parameters, the Durbin Watson serial correlation test was used to carry out the analysis of autocorrelation in the data, which is a major shortcoming in the data analysis that must be examined. The findings are shown in Table 4.4.

Table 4.4: Autocorrelation Results

Durbin Watson Statistic
1.926

Source: Research Findings (2022)

From the null hypothesis, no first-order serial/auto correlation exists. The 1.926 Durbin Watson statistical varies from 1.5 to 2.5 indicating no serial correlation.

4.3.4 Stationarity Test

The research variables were subjected to a unit-root test to establish if the data was stationary. The unit root test was ADF test. With a standard statistical significance level of 5%, the test was compared to their corresponding p-values. In this test, the null hypothesis states that every variable has a unit root, and the alternative hypothesis is that the variables are stationary. Findings depicted in Table 4.5.

Table 4.5: Stationarity Test

Variables	Statistic	P-value
Financial deepening	6.2126	0.0000
Mobile banking	8.2031	0.0000
Internet banking	7.8718	0.0000
Agency banking	6.8447	0.0000
Mpesa	6.8132	0.0000
Interest rate	6.1398	0.0000
Inflation	5.9362	0.0000

Source: Research Findings (2022)

As demonstrated in Table 4.5, this test concludes that the data is stationary at a 5% level of statistical significance since the p-values all fall below 0.05.

4.4 Correlation Analysis

Pearson correlation was employed to establish the relationship linking financial deepening in Kenya to mobile banking, internet banking, agency banking, Mpesa, interest rate, inflation and economic growth. The results are as shown in Table 4.6.

Table 4.6: Correlation Analysis

		Financial deepening	Mobile banking	Internet banking	Agency banking	Mpesa	Interest rate	Inflation
Financial deepening	Pearson Correlation	1						
	Sig. (2-tailed)							
Mobile banking	Pearson Correlation	.600**	1					
	Sig. (2-tailed)	.000						

Internet banking	Pearson Correlation	.615**	.913**	1			
	Sig. (2-tailed)	.000	.000				
Agency banking	Pearson Correlation	.585**	.949**	.982**	1		
	Sig. (2-tailed)	.000	.000	.000			
Mpesa	Pearson Correlation	.737**	.932**	.968**	.963**	1	
	Sig. (2-tailed)	.000	.000	.000	.000		
Interest rate	Pearson Correlation	.359*	.071	.129	.094	.191	1
	Sig. (2-tailed)	.023	.665	.429	.564	.239	
Inflation	Pearson Correlation	-.677**	-.516**	-.478**	-.418**	-.304	1
	Sig. (2-tailed)	.000	.001	.002	.007	.056	

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

* . Correlation is significant at the 0.05 level (2-tailed).

c. Listwise N=40

Source: Research Findings (2022)

From the study's findings, a strong positive that is statistically significant relationship exists between mobile banking and financial deepening ($r = .600$, $p = .000$). The correlation results further revealed a strong positive and significant statistical connection between internet banking and financial deepening ($r = .615$, $p = .000$); agency banking and financial deepening ($r = .585$, $p = .000$); Mpesa and financial deepening ($r = .737$, $p = .000$); and interest rate and financial deepening ($r = .359$, $p = .023$). Inflation exhibited a strong negative and significant association with financial deepening in Kenya ($r = -.677$, $p = .002$).

4.5 Regression Analysis

Mobile banking, internet banking, agency banking, Mpesa, interest rate and inflation were utilized as agents to predict financial deepening in Kenya. The test was done at 5% level of significance. Table 4.7 to 4.9 displays the results.

Table 4.7: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.878 ^a	.770	.729	.0174

a. Predictors: (Constant), Inflation, Interest rate, Agency banking, Mobile banking, Mpesa, Internet banking

Source: Research Findings (2022)

The R squared indicator indicates how the explanatory variables may describe variations in the response variable. As indicated in Table 4.7, the R square was 0.770, indicating that change in mobile banking, internet banking, agency banking, Mpesa, interest rate and inflation account for 77 percent of Kenya's financial deepening with other factors ignored in the research accounting for 23 percent of the variance in financial deepening in Kenya. The correlation coefficient (R) of 0.878 showed a significant connection amongst predictor factors and financial deepening.

Table 4.8: Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.034	6	.006	18.454	.000 ^b
	Residual	.010	33	.000		
	Total	.044	39			

a. Dependent Variable: Financial deepening

b. Predictors: (Constant), Inflation, Interest rate, Agency banking, Mobile banking, Mpesa, Internet banking

Source: Research Findings (2022)

The value of P obtained by ANOVA is 0.000, which is less than $p=0.05$. This demonstrates that the model's importance described how mobile banking, internet banking, agency banking, Mpesa, interest rate and inflation affect Kenya's financial deepening.

The relevance of various variables was determined using the model coefficients. The statistics of t and values of p were used to accomplish this. This study is significant since it allowed the researcher to determine which independent variables were chosen (mobile banking, internet banking, agency banking, Mpesa, interest rate and inflation) significantly influences the financial deepening of the Kenyan economy. The importance of the association between the two variables was shown by the sig. column's p-value. With a confidence level of 95%, a p-value of less than 0.05 was judged to be statistically significant, which is the most conservative estimate. Table 4.9 summarizes the findings.

Table 4.9: Model Coefficients

Model	Unstandardized		Standardized	t	Sig.
	Coefficients		Coefficients		
	B	Std. Error	Beta		
(Constant)	-.137	.047		-2.856	.007
Mobile banking	.760	.002	.758	7.384	.000
Internet banking	.294	.008	.286	2.074	.046
1 Agency banking	.005	.002	.007	.046	.964
Mpesa	.446	.004	.446	4.413	.000
Interest rates	.024	.000	.024	1.273	.212
Inflation	-.437	.000	-.437	-4.013	.000

a. Dependent Variable: Financial deepening

Source: Research Findings (2022)

Table 4.9 shows that mobile banking; internet banking and Mpesa had a sizeable positive impact on financial deepening as indicated by positive coefficients and p values less than 0.05. Inflation was established to possess negative and considerable outcome

on financial deepening, as shown from the negative coefficient and a p value less than 0.05.

The following regression was estimated:

$$Y = -0.137 + 0.760X_1 + 0.294X_2 + 0.446X_3 - 0.437X_4$$

Where,

Y = Financial deepening

X₁ = Mobile banking

X₂ = Internet banking

X₃ = Mpesa

X₄ = Inflation

Using the constant = -0.137, we can conclude that if selected independent variables (mobile banking, internet banking, agency banking, Mpesa, interest rate and inflation) were rated zero, financial deepening would be -0.137. Increasing mobile banking by one unit would increase financial deepening by 0.760 units; increasing internet banking by 1 unit would increase financial deepening by 0.294 while increasing Mpesa by one unit would cause the financial deepening to increase by 0.446. Increasing inflation by 1 unit would lead to a fall in financial deepening by 0.437 units.

4.6 Discussion of Research Findings

This research had an aim of establishing the way in which the predictor variables impacted the financial deepening in the Kenyan context. Independent variables included mobile banking, internet banking, agency banking, Mpesa, interest rate and inflation. This research tried to show financial deepening being a dependent variable. The ratio of credit to the private sector as a proportion of GDP measured financial deepening. Correlation as well as regression analysis were utilized to show the connection linking the independent to dependent variables.

The Pearson model showed a strong positive that statistically significant relationship exists between mobile banking and financial deepening. The correlation results further revealed a strong positive and significant statistical connection between internet banking and financial deepening; agency banking and financial deepening; Mpesa and financial deepening; and interest rate and financial deepening. Inflation exhibited a

strong negative and significant association with financial deepening in Kenya.

The independent variables accounted for 77% of variances in financial deepening, in accordance with the summary of the model. The predictor variables of this research had explanatory power that fitted a 95% confidence level like indicated by the 0.000 p value, which was below the threshold of significance that is 5%. Therefore, the overall model employed in this study is a good and sufficient prediction model to determine the financial deepening in Kenya.

This research is in agreement with Liu and Walheer (2022) who adopt a composite index approach for establishing the interrelationship between fintech, financial deepening and economic development. The study uses demand and supply side data to define financial deepening in terms of three key aspects, and it acknowledges that digital and financial technology are becoming more important in promoting financial deepening. By separating the effects of catching up and environmental change, they then examine how financial deepening has changed over time. With the latter, they can assess the potential for policy interventions and determine if policymakers were successful in fostering an environment that encouraged financial deepening. The empirical study reveals key trends that can be used to comprehend variations in financial deepening and create new policy initiatives.

The research is also in agreement with Demir, Pesqué-Cela, Altunbas and Murinde (2022) who investigates the interrelationship between FinTech, financial deepening and income inequality for a panel of 140 countries using the Global Findex waves of survey data for 2011, 2014 and 2017. They posit that FinTech affects inequality directly and indirectly through financial deepening. They invoke quantile regression analysis to investigate whether such effects differ across countries with different levels of income inequality. They uncover new evidence that financial deepening is a key channel through which FinTech reduces income inequality. They also find that while financial deepening significantly reduces inequality at all quantiles of the inequality distribution, these effects are primarily associated with higher-income countries.

The findings are also in support of a study done by Misati, Osoro, Odongo and Abdul (2022) who evaluated financial innovation impact on financial deepening and economic

growth in Kenya. They employed autoregressive distributive lag models. Real gross domestic product (GDP) and Credit to private sector indicators were used to measure economic growth and financial depth respectively. The results reveal that mobile transactions in value, the number of mobile agents and internet have significant positive impact on financial deepening. However, with advancement in mobile and agency banking models, bank branches have negligible contribution to financial deepening. The findings further reveal that the impact of innovations on economic growth is indirect through financial depth channels. They therefore concluded that investment in cost effective innovation will be key determinant of bank's profitability.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The major motive of this study was to investigate the way financial technology influences the financial deepening in Kenya. The findings from the above sections are outlined in this chapter together with the conclusions and limitations of this study. This section also outlines the recommendations that can be adopted by policymakers. It also outlines the areas for further research.

5.2 Summary of Findings

The study assessed how financial technology influenced the financial deepening in Kenya. Mobile banking, internet banking, agency banking, Mpesa, interest rate and inflation were adopted to be the predictor variables of the research. The study used descriptive design to do analysis and data collection. Secondary data was obtained from CBK as well as KNBS and prepared using SPSS version 24 program. The study used data of 10 years compiled quarterly.

The findings revealed a strong positive that is statistically significant relationship exists between mobile banking and financial deepening. The correlation results further revealed a strong positive and significant statistical connection between internet banking and financial deepening; agency banking and financial deepening; Mpesa and financial deepening; and interest rate and financial deepening. Inflation exhibited a strong negative and significant association with financial deepening in Kenya.

The R-square coefficient was 0.770, meaning that the selected predictors can explain 77% of financial deepening in Kenya, with 23% of growth changes relating to factors not considered in this research. This study showed that independent factors together had a significant effect on financial deepening. ANOVA stresses that the F statistic with $p=0.000$ is significant at 5 percent demonstrating that the model had the capability to capture independent variables effect on the financial deepening in Kenya.

The regression results further discovered that if the selected independent variables (mobile banking, internet banking, agency banking, Mpesa, interest rate and inflation) were rated zero, financial deepening would be -0.137. Increasing mobile banking by one unit would increase financial deepening by 0.760 units; increasing internet banking by 1 unit would increase financial deepening by 0.294 while increasing Mpesa by one unit would cause the financial deepening to increase by 0.446. Increasing inflation by 1 unit would lead to a fall in financial deepening by 0.437 units.

5.3 Conclusion

The outcomes of this study show that the financial deepening in Kenya is positively influenced by mobile banking. This study concludes that increasing mobile banking uptake causes a rise in financial deepening. The researcher concluded that internet banking has a significant positive influence on financial deepening implying that internet banking uptake leads to financial deepening. This study also finds that Mpesa carries a considerable positive impact on financial deepening in the country. Inflation was found to have a significant negative effect on financial deepening and so it is concluded that high inflation slows financial deepening.

The study concludes that the factors under research – mobile banking, internet banking, agency banking, Mpesa, interest rate and inflation – affect financial deepening by describing 77% of the variations. This means that the non-model variables are only responsible for 23% of variations of financial deepening in the country. It is therefore substantial to infer that the outlined factors affect the financial deepening as shown in the ANOVA summary by p values less than 0.05.

The conclusions of this research concurred with Mwai (2021) who sought to establish the effect financial innovations have on financial deepening of commercial banks in Kenya. Secondary data was collected from Kenya National Bureau of Statistics, World Bank website, Central Bank of Kenya, published financial accounts statements of all the 43 commercial banking institutions in Kenya, and the Banking survey publications for a time period ranging between 2012 and 2018. Inferential and descriptive statistics were adopted for data analysis. Positive significant relationship between mobile phone

banking, automated teller machine, online banking, agency banking and financial deepening were reported. Bank size had positive moderating effect on financial innovations and financial deepening of Commercial banks in Kenya.

5.4 Recommendations

Outcomes show that mobile banking possesses a positive and significant impact on financial deepening in Kenya implying a rise in mobile banking uptake leads to a rise in financial deepening. This research recommends the need for policy makers to create a conducive environment for financial institutions to enhance their mobile banking offering as this will enhance financial deepening. The policy makers should also work on lowering the risks associated with mobile banking as this will increase confidence among the consumers.

This study revealed a positive and significant impact of internet banking on financial deepening in Kenya implying a rise in internet banking uptake leads to a rise in financial deepening. This research recommends the need for policy makers to create a guideline to enable financial institutions enhance their internet banking offering as this will accelerate financial deepening. The policy makers should also work on lowering the risks associated with internet banking as this will increase confidence among the consumers.

This study also demonstrated that Mpesa impacts positively on financial deepening. This implies that higher Mpesa transactions are likely to enhance financial deepening in the Kenyan economy. The research suggests the need for policymakers in Kenya to make sure that the drivers of Mpesa are addressed to enhance sustainable growth which will then lead to a rise in financial deepening.

This study has demonstrated that the rate of inflation has a negative and significant effect on the financial deepening in the country. It therefore recommends that several approaches are required to make sure that the factors that lead to rise in inflation are well handled to make sure that the inflation does not negatively influence financial deepening. The government should work on lowering the cost of production that brings

about cost push inflation while at the same time ensuring sufficient supply of goods and services as this reduces the possibility of demand-pull inflation.

5.5 Limitations of the Study

This study embraced a 10 years period (2012-2021). It gives no substantial evidence that in an added timeframe, the findings will not change. Additionally, it is not certain that these findings will be sustained after 2021, things might change. Extra timeframe is reliable because it comprises instances with economic shifts like recessions and booms.

The main drawback of the study was the quality of data. It is not possible to reliably state the results obtained in the survey as the correct reflection of the general situation. Accuracy and reliability of the data collected are assumed to a certain point. Additionally, this study uses secondary data as opposed to primary data which is first-hand information. Further, the determinants of financial deepening are many but only six were considered because of unavailability of data for all determinants.

Regression models were used in data analysis. It would be impossible for the researchers to generalize outcomes because of the setbacks accruing from utilizing regression model like erroneous and misleading conclusions resulting from a change in value of variable. Outliers are known to affect the standard errors in a regression model leading to erroneous conclusions.

5.6 Suggestions for Further Research

The aim of the study was to determine the impact financial technology on financial deepening of the Kenyan economy. A research that focuses on primary data or a mix of primary data with secondary data is recommended so as to recognize qualitative elements that might have been overlooked in the current research. A qualitative study can also be conducted to compliment the findings of this study.

This research failed to consider all independent variables that affect financial deepening of an economy. A suggestion therefore arises to include other factors in future studies in order to come up with more comprehensive findings. These factors include

unemployment, money supply, corruption, financial literacy among others. Providing details how each of them affects financial deepening will enable policymakers to make a decision on the steps to take to enhance financial deepening.

This study focused on the latest 10 years. Other future studies should employ a wider range to come up with a valid conclusion. This study was also under restriction because it only focused solely on Kenya. Additional survey should be conducted in other nations to determine results. Finally, the investigator adopted a regression model to do a confirmation or rejection of the findings. Future studies should adopt other methods to confirm or reject their hypotheses.

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APPENDICES

Appendix I: Research Data

Year	Qr	Financial deepening	Mobile banking	Internet banking	Agency banking	Mpesa	Interest rate	Inflation
2012	1	0.2183	16.08845	6.92952	10.16416	5.1818	6.9167	16.8333
	2	0.2264	16.17037	6.93925	10.33644	5.3083	6.7500	15.9200
	3	0.2157	16.48467	6.96224	10.43620	5.4553	6.0000	13.3933
	4	0.2314	16.59342	6.96885	10.55111	5.5910	6.0000	10.3000
2013	1	0.2617	16.64967	6.98657	10.46061	5.7652	5.8333	7.8500
	2	0.2859	16.70269	7.02287	10.58519	5.8406	6.0833	5.8667
	3	0.2827	16.73890	7.03878	10.71126	5.8749	6.5000	4.7067
	4	0.2883	16.77494	7.05704	10.80255	5.9243	15.1667	4.0333
2014	1	0.3120	16.75759	7.06219	10.89505	5.9454	18.0000	4.1567
	2	0.3177	16.79477	7.09008	10.98578	5.9584	18.0000	6.0133
	3	0.2911	16.78883	7.11070	11.08167	5.9713	15.3333	9.0200
	4	0.3029	16.83317	7.14835	11.21681	5.9839	11.6667	12.7767
2015	1	0.2099	16.89971	7.14992	11.39696	6.0162	9.5000	15.8267
	2	0.3146	16.96879	7.16085	11.51316	6.0753	8.8333	16.2900
	3	0.3229	16.99509	7.18007	11.59192	6.1377	8.5000	14.2967
	4	0.3315	17.02979	7.20192	11.63153	6.2086	8.5000	10.6967
2016	1	0.3185	17.07465	7.21229	11.65361	6.2186	8.5000	7.2567
	2	0.3262	17.07211	7.23273	11.68174	6.2344	8.5000	5.0433
	3	0.3379	17.08456	7.25559	11.72629	6.2596	8.5000	4.5633
	4	0.3421	17.05015	7.27448	11.73294	6.2897	8.5000	5.3867

Year	Qr .	Financial deepening	Mobile banking	Internet banking	Agency banking	Mpesa	Interest rate	Inflation
2017	1	0.3214	17.05475	7.27517	11.75353	6.3226	8.5000	6.2033
	2	0.3271	17.08769	7.28070	11.77712	6.3315	9.0000	6.8267
	3	0.3359	17.11258	7.29438	11.82081	6.3578	11.5000	7.2367
	4	0.3427	17.15064	7.32844	11.86580	6.3716	11.5000	6.9767
2018	1	0.3298	17.20870	7.33106	11.91098	6.3835	11.5000	6.6667
	2	0.3149	17.26147	7.33302	11.96735	6.3936	10.8333	6.6567
	3	0.3192	17.30724	7.33694	12.05249	6.4019	10.5000	6.3900
	4	0.3046	17.35429	7.34019	12.04317	6.4085	10.5000	6.4367
2019	1	0.3111	17.32758	7.32909	11.95185	6.4151	10.0000	6.8400
	2	0.3029	17.34841	7.33041	12.00326	6.4216	10.0000	6.5900
	3	0.3072	17.37512	7.32383	12.03293	6.4265	10.0000	6.4700
	4	0.3262	17.41536	7.32515	12.08173	6.4329	10.0000	6.4033
2020	1	0.2813	17.46704	7.32317	12.16551	6.4409	9.5000	6.4833
	2	0.2790	17.54199	7.32185	12.20852	6.4473	9.0000	7.7233
	3	0.2795	17.58784	7.32119	12.21637	6.4520	9.0000	8.3233
	4	0.2730	17.65399	7.31655	12.24532	6.4615	9.0000	8.1533
2021	1	0.2765	17.66349	7.32383	12.27146	6.4677	9.0000	7.3600
	2	0.2756	17.73447	7.32581	12.32760	6.4723	9.0000	5.6833
	3	0.2745	17.81897	7.34923	12.31571	6.4862	9.0000	4.7033
	4	0.2753	17.86842	7.37588	12.31567	6.5191	8.8300	4.6033