EFFECT OF FINANCIAL TECHNOLOGY ON FINANCIAL SERVICES DEVELOPMENT IN KENYA

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DECLARATION

I the undersigned, declare that this report is my own original work and has not been presented to any university or institution for any award.

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DEDICATION

I dedicate this report to my Father, Mwalimu Dominic Chomba and everyone who supported in the various stages of the research work.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
ATM	Automated Teller Machine
CBK	Central Bank of Kenya
FSD	Financial Services Development
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
GOK	Government of Kenya
ICT	Information, Communication and Technology
IMF	International Monetary Fund
KNBS	Kenya National Bureau of Statistics
SPSS	Statistical Package for Social Sciences
TAM	Technology Acceptance Model
VIF	Variance Inflation Factors

ABSTRACT

Fintech continues to change and shape the financial sector in Kenya. The Kenyan banking sector has focused increasingly on mobile banking and internet banking as a strategic instrument to achieve organization goal of reducing costs and maximizing returns. The major issue is if the adoption of fintech contributes to financial sector development in Kenya. This research aimed to bring out the effect of financial technology on the financial services development in Kenya. The research established the effect of mobile banking, ATMs and internet banking on financial services development in Kenya. Economic growth and interest rate were used as the control variables in the model. Descriptive research design was used. Research variables data were derived from CBK and KNBS quarterly reports from 2011 to 2020. Regression and correlation analysis were used to test the study hypotheses by establishing the relationship between financial technology and FSD. The results indicated R^2 of 0.751 which implied that the selected independent variables contributed 75.1% to variations in FSD. The study further found that mobile banking (β=0.419, p=0.001), ATMs (β=0.498, p=0.000) and internet banking (β=0.243, p=0.017) recorded a positive and significant association with FSD in Kenya while economic growth and interest rates were not statistically significant. Thus the research recommends the need for policy makers to provide a conducive environment for financial service players to undertake financial technology as this enhances financial services development in Kenya. Managers and directors of commercial banks should also work on improving their financial technology coverage in a bid to enhance their performance as this will in effect contribute to financial development in Kenya.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

A considerable amount of change has occurred in the global banking industry during the last several decades (Nejad, 2016). Fintech (financial technology) has been an important part of the economy for a long time. Fintech is essential for directing money to efficient purposes and allocation of risk to people who can utilize them and boosting financial development. Failure to adopt fintech leads to exclusion of many households from the traditional banking systems leading to slowed financial development which in essence translates to slow economic development (Neaime & Gaysset, 2018). Financial technology has made has made a significant contribution in shaping how financial institutions work and has helped provide the foundation upon which financial institutions stand out from the others in competitive market (Cihak & Singh, 2013).

Research was supported by theories including model of adoption of technology, the theory of financial intermediation and the diffusion of innovation theory which aim to work out connections between fintech and financial development. Mises (1912) was the first to advance the financial intermediation theory, which claims that financial institutions must invest in financial intermediation and also make it convenient and convenient for their clients to trade in order to maximize their performance. The mechanism via which a new thought is disseminated to a particular societal system relies on utilizing a specific preference channel (Rogers, 1995). The Technology Acceptance Model (TAM) provides clarity on how customers incorporate and exploit an innovative concept (Davis, 1989). To learn how financial institutions in Kenya absorb new technologies, TAM will be used in this study.

Kenya has a variety of financial technologies accessible, including mobile phone applications, mobile cash borrowing and payroll borrowing as well as many suppliers, comprising banks, SACCOs or mobile network providers (Waithanji, 2016). Several of these lending institutions are unlicensed and loans are accessible in areas not covered by existing legislation. The services often involve (relatively) short-term, low-interest loans. Most businesses utilize client cell phone information including, social media, transaction history of mobile, SMS record and calls for the evaluation of credit scores and loan amounts (Mohamed, 2018). M-Shwari is the most popular type of credit, over the M-Pesa system, Commercial Bank of Africa is offering both a savings account and a loan via the M-Pesa system. In January 2019, Fuliza is yet another financial technology which seeks to overwrite consumers via mobile platforms (CBK 2019).

1.1.1 Financial Technology

Sheleg and Kohali (2011) define financial technology as any technical innovation that has an impact on the operationalization of financial industry. Financial technology is defined as businesses that combine financial services with current technology to provide user-friendly, automated, transparent, and efficient internet-based and application-oriented services (Triki & Faye, 2013). Financial technology, according to Freytag and Fricke (2017), is innovative technology that supports financial services. Banks ought to offer platforms of social network in the future, allowing clients to utilize their mobile devices to exploit financial technology-enabled investing opportunities (World Bank, 2017).

Various technical solutions targeted towards ease, shorter turnaround times, and operational efficiency are available in the financial technology space (Klapper, 2016). FinTech firms have the capability to influence a variety of different stakeholders in the

financial sector. Through the supply of asset management services to retail consumers, by use of streamlined systems, algorithms, and robotics, the enhancement of asset management services has occurred. Cryptocurrencies, such as Bitcoin, have also had an impact on the banking sector through monitoring people's savings, credit scores, how much they spend, how much they owe in taxes. In addition to conventional banking services, such as quicker transactions via distributed ledger technology, contactless transfers, and the usage of cryptocurrency exchanges, banking services extend to the Internet of Things (IoT), smart contracts, and fintech (Yang & Liu, 2016).

Financial technology that is used nowadays in many financial transactions, according to Demirguc-Kunt et al. (2018), mobile banking also involves a connection to a business or employee bank account through a mobile phone. The growth of the Internet has allowed financial institutions to provide their services through the Internet, which they own. Peer-to-peer lending is a new form of lending in which individuals can get loans from others or loan money to others without the use of a bureaucracy bank as a middleman, a digital ledger and blockchain where all kinds of digital currency transactions are recorded openly and chronologically, as well as other technology services such as banking, credit cards, and ATMs. This study attempted to quantify the level of financial technology, as defined by a number of transaction made via banking process such as mobile, ATMs and internet banking.

1.1.2 Financial Service Development

Effectiveness, indebtedness, stable and availability are characteristics of financial service development (FSD) according to the World Bank (2017) advancement in the financial system. Financial service development, according to Roubini and Bilodeau (2008), is defined as enabling infrastructure, institutions, and policies that result in deep

and wide accessibility to financial capital services as well as effective financial intermediation. In order to evaluate the progress of financial sector and articulate its subsequent impression on alleviation of poverty and economic growth, it is essential to have a strong financial development measurement (Mehrotra & Yetman, 2015).

Financial institution magnitude and market, i.e. depth of finances, degree of utilization of service in the financial sector such as accessibility, efficiency in mediating resource and facilitating financial transaction, for instance efficiency, are four traditional ways to determine financial development, according to Levine et al. (2012). Various financial development criteria have been developed based on this premise.

Ayadi et al. (2013) employed three financial development metrics that may be utilized for measuring financial development. These include: 1) Private sector credit (percent GDP); 2) Deposits of banks (percent GDP); 3) Capitalization of the stock market (percent GDP). Whilst Standley (2008) utilized five variables, namely Deposit money-banking assets (percent GDP), Value traded, Currency to the private sector (percent GDP) in assessing financial market growth in Sub-Saharan Africa; (percent GDP). The present research utilized loans from all financial institutions to the private sector as a % of GDP.

1.1.3 Financial Technology and Financial Services Development

Davis (1989) believes that every economically impactful development is related to entrepreneurship, market power and innovations. From this reasoning come theories of the Fintech revolution. Rogers (1995) also believes that invention briefly establishes a monopoly, whereupon copywriters compete and remove the dominance. If the financial institutions utilize financial technology and guarantee they hedge against rival banks

by using new goods and services, they certainly have an effect on financial development.

With the increase of Fintech households, borrowings and savings are simpler to obtain since consumption is decreasing (Mehotra & Yetman, 2015). One of Fintech's anticipated advantages is that many people in society will have access to lending and Long-term financial growth is aided by saving facilities that contribute to economy of scale (Rasheed et al., 2016). Access and use those facilities are a key element in fostering reduction in poverty, social development and sustainable economic unemployment, financial stabilization and unemployment (Zins & Weill, 2016).

According to Lenka and Sharma (2017), financial availability generates employment for rural residents since greater involvement in economic activities, especially in rural regions, increases people's discretionary income, thereby promoting their deposit and savings through the multiplier effect. The failure to acquire financing resulting from low-fintech adoption has a detrimental impact on financial development. This is because the lack of money discourages investments and savings in revenue generating activity from the poor. Neaime and Gaysset (2018) argued that simple access to financing from fintech enables companies to spend more, thus accepting greater risk, and encouraging financial growth.

1.1.4 Financial Technology and Financial Services Development in Kenya

Financial sector has seen considerable expansion in both size and complexity, which have significantly benefited total economic growth (CBK, 2019). The industry consists primarily of banking, insurance, capital market, cooperatives and pensions for credit and savings. The other major participants include microfinance organizations; money transfers businesses, foreign exchange offices and development financing institutions.

In addition, there are security networks and resolution organizations which include policyholder compensation funds for the insurance sector, for the Kenya Deposits Insurance Trade Microfinance Bank and for capital markets; we have an investment compensation fund.

Kenya's expanding financial sector effort in 2005 was set up to promote capital accumulation and poverty alleviation via increased accessibility to financial services to low-income households and small enterprises. Several financial service providers have seen increased competition in the past five years, leading them to create methods to target the low-income sectors. This has led to greater technical innovation and partially to a rise in the use of fintech. The launch of commercial banks of agency banking, Internet banking and mobile banking has provided advantages as they compete in the area of mass markets. In addition, the state has played an important role in developing appropriate laws to facilitate low-income banking and boost microfinance organizations. All this in the nation which is hypothetical to enhance financial development has improved fintech (CBK, 2018).

Fintech continues to change and shape the financial sector in Kenya. The Kenyan banking sector has focused increasingly on agency banking and agency banking as a strategically instrument to achieve organization goal of reducing costs and maximizing goals. The major issue is if the financial development resulting from the use of Fintech has improved. Because of this, the KCB Bank Group has been promoting KCB Mpesa since 2008. Other institutions, including Equity Bank, have followed suit.

1.2 Research Problem

The use of financial technology by the financial industry has increased significantly worldwide. This has increased the effectiveness of banking activities such as stocks

trading, product creation, and electronic and digital payments, to name a few, resulting in enormous cost savings. This has enhanced the quality of the banks' services worldwide (Babajide et al., 2015). The financial sector undergoes a worldwide change, with banks embracing new technology and revising regulations, as per Kohali and Sheleg (2011). As a consequence, banks have started incorporating technology into their activities. Technology has made some jobs cheaper and better, yet its own difficulties have also been created (Aladwani, 2001). To save expenses, banking firms have used technology to create alternative banking platform, increase convenience and efficiency, and eventually boost financial growth (Kombe & Wafula, 2015).

Ever since the collapse of large banks in the 1990s, Kenya's financial industry has been confronted with a number of difficulties. A variety of financial technology service has been embraced by commercial bank including mobile banking, internet banking and ATMs to reduce operational expenses (Chishti, 2016). The Kenyan Central Bank increased the commercial banking scope in 2010, enabling it to operate via licensed third-party agents that may act on its behalf. Between 2007 and 2012, over 40 thousand mobile payment agencies were installed throughout the country. The ten main banks throughout the country, including the Kenya Commercial Bank and the Equity Bank, have developed around 10,600 agents who have numerous network than almost any company have been built throughout the nation. All of these approaches are aimed at lowering the operational expenses of commercial bank (Waithanji, 2016).

International researches in this field have focused primarily on financial technologies on various financial growth elements. Stoica, Mehdian, and Sargu (2015) investigated how internet banking affects Romanian bank performance and it has been shown that efficient and cost-effective services delivered through e-banking enhance banks

profitability. The effect on local bank performance in Oslo, Norway, was studied by de Young et al. (2015). According to the findings, internet banking has increased bank profitability. From 2006 to 2014, Wadhe and Saluja (2015) investigated how Electronic banking impacts the profitability of Indian banks. The findings demonstrated that, in both private and public sector banks, electronic banking recorded a positive connection with profitability. All of these investigations were conducted in a distinct setting, thus their results cannot be applied to the current situation.

Locally, the Mutinda (2018) research showed that mobile banking has an important adverse link to profit of Kenyan commercial banks in regards to technological developments in profitableness. In contrast, Kariu (2017) has investigated Kenya's financial technology and profits of commercial banks and found that financial technology has substantial connection with return of commercial bank. Those results also contradicted Kamande (2018), whose findings show that only banking agencies have a statistical positive connection with financial success, whereas mobile banking, online banking and ATMs are statistically insignificantly favorable about financial performance. Sujud and Hashem (2017), students of financial technology and profitability of corporate banks, discovered that financial technology has a favorable statistical relationship to profitability. Although similar local studies have been conducted in this area, most did not concentrate on Fintech's impact on Kenya's financial development, the subject of the present research. The goal of this study was to determine the impact of financial technology on the financial growth of Kenya by addressing this research question: What effect does financial technology have on the financial growth of Kenya?

1.3 Research Objectives

The study's objective was to determine the effect of financial technology on financial services development in Kenya.

1.4 Value of the Study

This study will aid in development of theories related to financial technology and financial development. Scholars, students and researchers who want to conduct similar or correlated investigations will also utilize findings as a referential in the future. The findings of the research will also aid academics and scholars in the identification of additional topics of study by identifying relevant problems that need more investigation and statistical evidence to close study gaps.

Policymakers such as the government and its agencies, such as the CBK and the CMA, will profit from the development and execution of laws as well as regulations that control financial system activities. The improved financial health of the entire country will be aided by smart financial technology policies, as well as various technological innovations that are discovered to have a positive impact on financial returns.

Practitioners can also benefit from this study as the results will enable them to more accurately gauge the functions of financial technologies in a financial institution's performance and overall financial development and will enable them to take the appropriate measures to optimize development. In addition, the study will provide theoretical advances in the areas of financial technology and financial development.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The theoretical foundation for the study is presented in this chapter, which also review prior research on financial technology and development. This chapter contains an empirical review, theoretical review and research gaps.

2.2 Theoretical Framework

This study examined numerous theories which attempts explaining how financial technology is related to financial development. The following theories will be considered financial intermediation, model of technology acceptance and diffusion of innovation.

2.2.1 Financial Intermediation Theory

Mises (1912) developed theory of financial intermediation, which asserts that banks are key participants in financial intermediation. Banks mobilize clients' money and provide it to those who are short on funds at a rate known as interest. An arrangement like this allows the banks to give the financial system a condition of liquidity, since short-term client money is taken and used to provide longer-term money for their customers (Dewatripont, Tirole & Rochet, 2010). According to the Austrian economist Ludwig von Mises (1912), banks have a central function as debt negotiators, as they lend money borrowed from the public.

Borrowing and lending money are the two major roles played by banks when it comes to financial intermediation. According to Austrian economist Ludwig von Mises (1912), participation in financial intermediation by banks curtails their ability to create money while concurrently exposing them to the chance to do so. Critics such as Allen

and Santomero (2001) say that the concept of participation costs has been front and center when it comes to risk management in the financial industry, and it posits risk management as an evolving concept. This idea is relevant to the research since boosting financial development can be accomplished by implementing innovative financial technology that enables simple and convenient banking activities for consumers.

2.2.2 Diffusion of Innovation Theory

This theory was initially put forth by W. R. Rogers (1995). The two authors, Mahajan and Peterson (1985), assert that a new idea, action, or object that is welcomed into a societal system as soon as it emerges is called an innovation. It aims to explain how internet and mobile banking are embraced and applied within the boundaries of societal structure (Clarke, 1995). Adoption of innovation is not instantaneous, but occurs over time, as discussed by Sevcik (2004). He also claims that opposition to change slows down the speed of how innovation is adopted.

These five attributes— complexity, compatibility, relative advantage, observability, and triability—influence how fast a company adopts new innovation (Rogers, 1995). To begin, Rogers contends that the manner in which a company understands its relative advantage, relative triability, compatibility, complexity, and observability will affect how much it adopts new innovation. Internet banking has been shown to be useful in Kenya, therefore once all of the necessary tools are in place, it will be used. Information technology departments and internet connectivity speed the rate of innovation adoption in enterprises. Banking innovations such as mobile, online and agency are applied in enterprises when an executive has given the go-ahead.

2.2.3 Technology Acceptance Model

The model of technology acceptance was conceived by Davis (1989). This model addresses customers' adoption behavior, which is utilized to select a system that is both beneficial and convenient to them. Moon and Kim (2015) explored the underlying essence of TAMs validity and found that TAMs core construction is not the determining factor of user acceptance—use of technology and other usability facets influence this. Davis (1989) asserted that technologies or computer system's anticipated utility is defined by the theory that it will substantially improve work performance once it is put in place. When an information system's user-friendliness is preserved, it is a sign that the user has learned how to run it and employ the new technology. The model focuses on simple use as a means of predicting system utility (Gefen, Karahanna & Straub, 2013).

When people believe electronic banking is effective, it's more likely to be used (Potaloglu & Ekin, 2015). Aspects like perceived simplicity of use and perceived usefulness are considered important in encouraging the adoption of e banking. Theory of Technology Acceptance has changed how researchers do their work. Key aspects of the current investigation is to identify the advantages and disadvantages of incorporating technology into commercial banks in Kenya and to look at how easy or difficult it is for fintech to be used within the financial sector in Kenya.

2.3 Determinants of Financial Development

A lot of variables affect a country's financial development. The bulk of these factors have an economic effect, the financial system is affected by the impact of this and, ultimately, growth in financial system. This section discusses the major factors that are

anticipated to influence financial development, including financial technology, economic growth, and interest rate (Athanasoglou et al., 2005).

2.3.1 Financial Technology

Fintech may be described as technologically competent financial solutions that are capable of providing the whole spectrum of commodities that were previously supplied by financial institutions (Arner, 2015). FinTech is often referred to be a new kind of monetary service trade that has emerged in recent years, which integrates information technology with monetary service such as transfer, payment, and assets management (Lee & Kim, 2015). A financial corporation made up of businesses that utilize technology to improve the efficiency of monetary systems (McAuley, 2015).

According to Stiroh (2001), improvements in business methods have resulted from the introduction of new technology, which has occurred in the modern era. Ongori and Migiro (2010) claimed ICT has brought about a complete shift in the standards on financial institution's performance and provision of customer service to banking customers. In a proposal to address global expansion, advance the delivery of client service and decrease transaction costs, banks have also been tremendously exploring technology, and have widely used financial technology networks to offer a wide range of commodities. Brynjolfsson and Hitt (1996) asserted that financial technology is the trigger for better production and the monetary advancement of the company. By lowering banks' trading costs, financial technologies make goods more accessible and affordable (Bames, 2014).

2.3.2 Economic Growth

Over a given period of time, economic growth is defined as a rise in the inflation-adjusted value of commodities traded on the international commodity markets (IMF,

2012). Ideally, the percentage increase in real GDP is calculated and done on a yearly basis. The growth rate relates to the annual geometrical growth rate of GDP at the beginning and end of the business year.. Undoubtedly, Osoro and Ogeto, (2014) alluded that growth rate is the averaged GDP production trend over the time period, preferably neglecting GDP volatility.

Patrick (1966) showed twofold causation relationship between among expansion and financial sector economic development. The granger components worked concurrently. He described the two connections as guiding supply and demand according to assumptions. The demand-following method, however, provided more evidence for the connection as a causal combination of economic development and financial expansion. Growing economic development and financial service increased in demand have spurred expanded financial industry. According to the theory of demand, financial markets have grown and improved because of increased demands for products from growing real economy. Growth in financial market was seen as a simple reaction to a rising economy. Real sector growth and development introduces different requirements on financial markets which boost the demand for new financial services and hence boost pressure to create more sophisticated and big financial institutions for preceding requirements for services to make the financial exacerbating of the real economy sector growth element (Cull, 1998).

2.3.3 Interest Rates

Government drives investments in developing countries, and the real interest rates is the primary factor affecting investments. Interest rate may influence financial expansion that can afterwards decline the rate of growth. In event of rising interest rate

on the financial markets, many are not encouraged to obtain loan for investment and other forms of growth would come to a halt (Quinn & Toyoda, 2008).

Nonetheless, investigations on connection among interest rates, financial growth and developments in most emerging nations have yielded no logical conclusions (Quinn & Toyoda, 2008; Kose et al., 2009; Obstfeld, 2009). The different findings are due to differences in the kind of interest rates measurement, country scope, sampling methodology, and techniques employed.

2.4 Empirical Review

Local and worldwide research in favor of Fintech's connection with financial development with diverse findings has been reported.

2.4.1 Global Studies

Kajewski (2014) focused on banking industry innovations, their benefits, obstacles, and advice for practice in Australia using descriptive research approach. From 38 commercial banks in Australia, secondary data was drawn and risk manuals and financial reports in order to create a better picture of industry risk. Autocorrelation techniques and regressions analysis were used to examine the information. The outcome showed that over time, banks have sought to make their services more accessible by investing in new technological platforms. The transactions volumes went up due to the improvements introduced with each transaction. He found that in the wake of innovation, financial institutions saw a reduction in the cost of doing business and more effective delivery of services to clients.

De Young et al. (2015) conducted research in Oslo, Norway, as far as the effect of internet goes on local banks' output and productivity. The population of interest in this research was 29 financial institutions, and it took place between 2006 and 2019. Using

a descriptive research methodology, the researchers found. Primary data (i.e., data that has been gathered directly from the sources) was used to gather information for the online questionnaire, and secondary data (i.e., information that has been compiled from annual financial reports) was utilized to collect that information. The outcome demonstrated that conventional lacal-based banks that do not adopt internet banking do not do as well as those that have, because their profits are significantly lower due to their total revenue and deposits and their operating costs are also more expensive. Furthermore, the study found that even if financial performance disparities are covered in a short amount of time due to economies of scale, economic gaps are hard to narrow quickly.

The study by Wadhe and Saluja (2015) investigated the profitability of Indian banks from 2006 to 2014, focusing on the effects of electronic banking. The research made use of data related to banks operating in the country. Analysis was performed to determine how banking services and profitability are interconnected using multiple regression. E-banking was shown to be related to increased profitability for banking sector. This outcome showed increasing number of ATMs increases profitability. While the connections were few, however, some might be established between the financial institutions' profit and the number of branches.

Sharma (2016) seeks to explore the mutual relationship between financial inclusion on a large scale and India's economic growth over 2004 to 2013, a growing nation. Financial inclusion may be considered from three basic financial inclusion principles. They are linked to a rise in the sum of individual who have accessibility as well as utilization of bank-related services, and increase the numbers of people who have such services (deposits). According to the research, as the economy grows, more people

likely to benefit from more financial inclusion. A bi-directional causation as well as a unidirectional causality was discovered by using a Granger causality research, which revealed that a connection between the amount of savings and loans accounts and GDP existed.

Kim et al (2019) examined fifty four published articles on relationship among inclusiveness, mobile services, and the expansion of the financial industry to identify the critical problems and gaps in their research. Results indicate that the bulk of the literature examined addressed three main areas: distribution, environmental and mobile networks. In the early phases of the research, the regions examined demonstrated a difference from the genuine supply and demand of consumers to the institutional and individual circumstances for mobile financial services and their social effect. Selecting of the techniques also showed minimal variety as well as depth.

2.4.2 Local Studies

Kinyua (2018) has carried out a bank performance and online banking research. The populations were gathered from Kenya's 42 banks. For this study, the natural record of the total value of transactions through online banking was utilized as the predictor variable. The response variable of the research was effectiveness, defined by dividing total asset and total income. A five-year timeframe of secondary data collection was carried out every year between janaury of 2013 and December of 2017. According to results, both variables in study showed statistical significance. The combination of online banking and liquidity produced good outcomes for this study, but the size of the bank produced a bad result. According to the results, sufficiency of capital does not substantially affect the performance of commercial banks.

Kamande (2018) examined how performance of Kenyan bank is affected by electronic banking financially. He has taken samples from each of 42 commercial banks in Kenya. Electronic banking, in addition to agency banking, has been selected as the prediction variable for transaction value produced by mobile banking, internet banking, and ATM. The return on assets was utilized to evaluate the financial performance selected as a response variable in the research. Secondary data were collected during a five-year period starting from first month of 2013 up to last month of 2017. The results of the research indicate the substantial beneficial impact of capital adequacy, agency banking, ATMs, liquidity and bank size. Mobile and web banking are statistically negligible drivers of performance of banks financially.

Wachira (2018) examined how bank's operational efficiency is influenced by alternative banking networks in Kenya. A total of 42 commercial banks in Kenya served as population. Alternative bank channel was evaluated through amount of transaction via internet, mobile, ATMs, and agency banking was used to compute independent variable. The operational performance was the response variable and was evaluated as operating costs at the overall revenue ratio. Secondary data were collected for five years each year from January 2013 to December 2017. Liquidity in this study was shown to have both a positive and substantial value. The research showed that ATMs, mobile banking, internet banking, corporate size and capital structure are not statistically significant factors determining the success of commercial banking.

The research interests of Wanalo (2018) were focused on investigating whether the use of technical financial technology (TFT) recorded a substantial impact on results on a monetary basis, and to do so, examined the commercial banks success in terms of financial results in Kenya. To do this project, the methodology involved in a descriptive

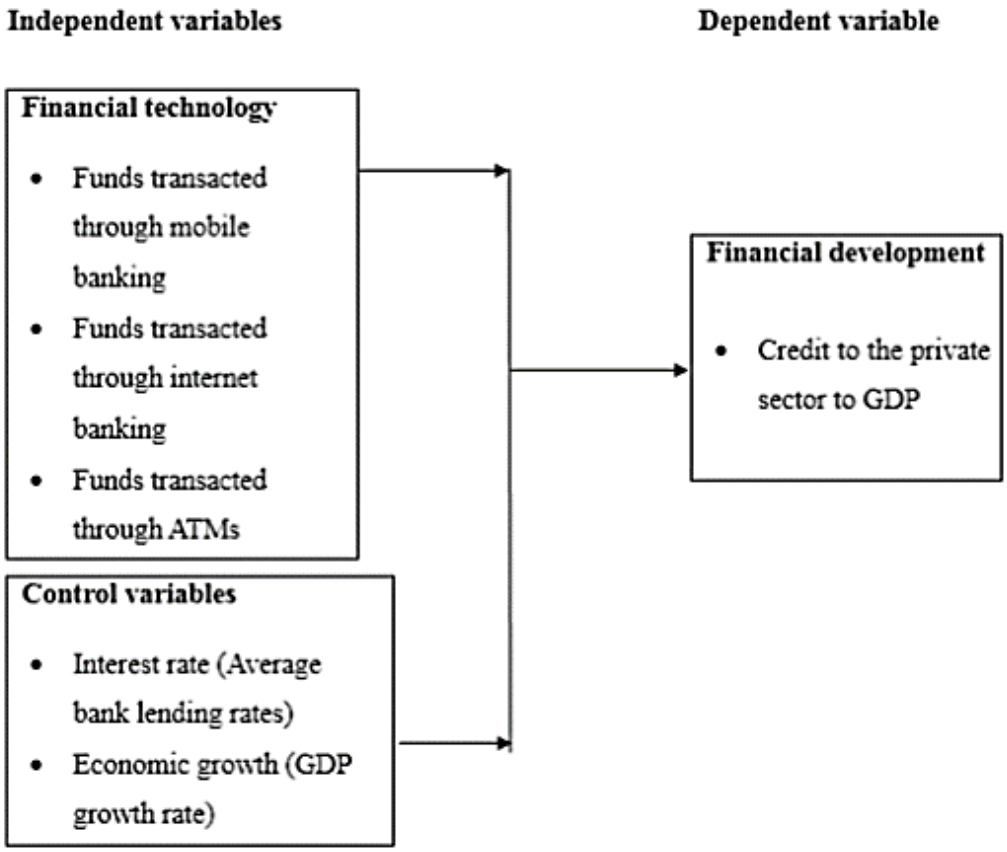
research was used. This research took into account commercial bankers' perspectives. This research included a total of 15 individuals and included banks from both the commercial and non-commercial sectors. Additional data was sourced from annual reports provided by commercial banks between 2012 and 2016, along with data gathered from the CBK and from the bank's website. Panel data analyses were used in the study. The regression results were discovered via the use of the model proposed by Prais Winstein. Despite the increased ATMs utilization and agency banking, they have little impact on a bank's overall financial health.

To better understand financial technology in regards to success in terms of financial results of regulated MFI in Kenya, Ogweno (2019) conducted a survey. A total of 13 regulated microfinance institutions (MFIs) currently serve the people of the study's community. The data for the first five years of the project's life was gathered on a yearly basis throughout that time. The link among variables was evaluated using a regression analysis, and design used was a descriptive crosssectional. The outcome indicated deposit, mortgage, and bank size all had a substantial impact on savings account balances and growth. There was no significant correlation found between agency banking, the number of ATMs, and the bank's financial performance.

2.5 Conceptual Framework

Conceptualizing the expected connection between variables is shown in the following diagram. Financial technology, defined as banking innovation such as internet, mobile, agency and ATM will be the predictor variable. Interest rates and economic growth will be the control variables. The dependent variable will be the amount of credit extended to private sector as financial development measurement.

Figure 2.1: The Conceptual Model



Source: Researcher (2021)

2.6 Summary of the Literature Review and Research Gap

Anticipated link between finance technology and financial progress has been described by many theoretical frameworks. Theories addressed are: theory of financial intermediation, model for the adoption of technology and diffusion of innovation theory. It has also studied what are the most important elements in financial development. Several local and worldwide research have been evaluated on financial technology and financial development. The results of these investigations were also discussed in this section.

From the literature study it was found that the current studies focused only on banks' fintech and financial performance, without examining how fintech affects financial development or examine the effect of fintech on other factors. From the above, while local studies linked to this field are available, most do not concentrate on the impact of fintech on financial growth in Kenya, which is at the center of this research. This study concentrated on the impact of financial technology on Kenya's financial development by addressing the research question: how does financial technology affect Kenya's financial services development?

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

For the purpose was to establish the impact of fin tech on financial development, the research study should include a research methodology that outlines the procedure that was followed in order to conduct the research. Incorporating four sections, this chapter discusses the research design, the procedure for collecting data, the diagnostic tests that were performed to validate the data, and finally, the technique for interpreting the results.

3.2 Research Design

In this study, a descriptive research approach was employed in assessing the effect of financial technology on the growth of the financial sector in Kenya. This study utilized the descriptive research design because it enabled information about the present condition of things to be collected (Khan, 2008). The research team was well-versed in the subject matter under consideration, however, they aim to understand more about the basis of the connection between the study parameters; the selected research design was thus most suitable. In particular, the objective of descriptive research was to give an exact and precise representation of the study variables which help to answer questions asked by the research (Cooper & Schindler, 2008).

3.3 Data Collection

This research was based on secondary data. In addition to KNBS and CBK publications, secondary data was gathered from other sources. Total private sector credits on a quarterly basis, transactions through ATM, transactions via mobile banking, transactions by internet banking and the central bank loan rate collected from

the CBK website are all partly the quantitative information gathered. KNBS provided data on GDP and GDP growth rates on a quarterly basis. The secondary data was gathered quarterly over a 10 year period between January 2011 and December 2020.

3.4 Diagnostic Tests

To ascertain viability of the model, a number of diagnostic tests were done, like normality, stationarity, multicolinearity, homogeneity and autocorrelation. The assumption of normality is that the dependent variable's residual was normally distributed and closer to the mean. This was accomplished by use of the Shapiro-wilk test. In the event that one of the variables had no normal distribution it was adjusted using the logarithmic adjustment methodology. Stationarity test was utilized in determining if the statistical features such as variance, mean and autocorrelation changed with the passage of time. This property was ascertained using the augmented Dickey Fuller test. In the event the data does not meet this property, the robust standard errors were utilized (Khan, 2008).

Autocorrelation is a measure of how similar one time series is when compared to its lagged value across successive timings. The measure of this test was done using the Wooldridge test and in the event that the presumption was breached, robust standard errors were used by the model. Multicollinearity exists when a perfect or near perfect linear relation is made between a number of independent variables. Variance Inflation Factors (VIF) and tolerance levels were utilized. Any multicolinear variable was eliminated and a new measurement used in place of the variable that has co-linearity. Heteroskedasticity confirms if the variance of the errors in a regression lies among the independent variables. This was tested using the Breusch Pagan test test and if data did not meet the homogeneity of variances assumption, robust standard errors were employed (Burns & Burns, 2008).

3.5 Data Analysis

After the various data sources have been surveyed, the data will be organized to serve the goal of the study. The version 23 SPSS computer program was used for the analysis. Central tendency measurements (such as mean and median) as well as measures of dispersion (such as standard deviation) will be calculated using descriptive statistic. Regression and Correlation analyses were required in the context of inferential statistics. Regression analysis involves understanding the cause and effect between the variables whereas correlation analysis establishes the degree of connection among the studied variables. A multivariate regression analysis was used in establishing the relationship between the dependent variable (financial development) and independent factors: ATMs, mobile banking, internet banking, interest rate and economic growth.

3.5.1 Analytical Model

A multivariate regression model was used to assess the relative importance of each of the explanatory factors in terms of financial services development in Kenya.

The adopted multivariate regression model as follows;

$$Y= \alpha+ \beta_1X_1+\beta_2X_2+\beta_3X_3+ \beta_4X_4 + \beta_5X_5 +\varepsilon$$

Where:

Y financial services development was computed in quarterly terms by total credit provided to the private sector and divided by GDP.

α was the regression constant (parameter of the function)

$ß_1$, $ß_2$, $ß_3$, $ß_4$ and $ß_5$ are the coefficients of independent variables

X_1 Mobile banking was assessed by the natural logarithm of the total amount of money transferred through mobile banking accounts quarterly

X_2 ATMs were assessed by the natural logarithm of money transferred quarterly through ATMs

X_3 Internet banking measured by the total amount of money exchanged on a quarterly basis via internet banking

X_4 Economic growth was assessed by the quarterly GDP growth rate

X_5 Interest rates was calculated on a quarterly basis by average bank loan rates

ε was the error term

3.5.2 Tests of Significance

The parametric tests were performed to evaluate the statistical importance of the overall model and the statistical relevance of individual parameters. The F-test, acquired from ANOVA, was used to demonstrate the statistical importance of the general model and that of the different variables was derived from the t-test.

CHAPTER FOUR
DATA ANALYSIS RESULTS AND FINDINGS

4.1 Introduction

This chapter focuses on data analysis. The research objective was to establish the relationship between financial technology and FSD in Kenya. Patterns were studied by descriptive and inferential analysis, that were then analyzed and conclusions drawn on them, in accordance with the specific objectives.

4.2 Descriptive Statistics

The research sought to describe the data in terms of their mean and standard deviations. The descriptive analysis was necessary as it helps in understanding the characteristics of the collected data before conducting inferential analysis. The results are displayed in Table 4.1

Table 4.1: Descriptive Results

	N	Minimum	Maximum	Mean	Std. Deviation
FSD	40	.2099	.3427	.294885	.0360242
Mobile banking	40	16.0885	17.8684	17.097315	.4149844
ATMs	40	7.4697	7.8721	7.770925	.1113631
Internet banking	40	6.9295	7.3759	7.211750	.1380305
Economic growth	40	.0919	.1232	.108315	.0081762
Interest rates	40	5.8333	18.0000	9.585415	2.8841915
Valid N (listwise)	40				

Source: Research Findings (2021)

Table 4.1 shows the descriptive analysis. The dependent variable was FSD whereas the independent variable was financial technology (mobile banking, ATMs and internet banking). Interest rate and economic growth served as the control variables.

4.3 Diagnostic Tests

To ascertain the model viability, a number of diagnostic tests were done, like normality, Multicollinearity test, stationarity, homogeneity of variance and autocorrelation.

4.3.1 Normality Test

To test whether the collected data assumed a normal distribution, normality test was performed using the Shapiro-Wilk Test. The threshold was that, if the p value is greater than 0.05, then the data assumes a normally distribution.

Table 4.2: Test for Normality

	Shapiro-Wilk		
	Statistic	Df	Sig.
FSD	0.881	40	0.094
Mobile banking	0.874	40	0.091
ATMs	0.892	40	0.101
Internet banking	0.923	40	0.120
Economic growth	0.874	40	0.094
Interest rates	0.892	40	0.116
a. Lilliefors Significance Correction			

Source: Research Findings (2021)

The normality test results indicated a p- value above 0.05 thus the null hypothesis rejection and acceptance of the alternate hypothesis meaning the normality test revealing normal distribution in the data.

4.3.2 Multicollinearity Test

Multicollinearity exists when a perfect or near perfect linear relation exist between a number of independent variables. Variance Inflation Factors (VIF) as well as tolerance levels were utilized.

Table 4.3: Multicollinearity

	Collinearity Statistics	
Variable	**Tolerance**	**VIF**
Mobile banking	0.684	1.463
ATMs	0.697	1.434
Internet banking	0.621	1.610
Economic growth	0.703	1.422
Interest rates	0.634	1.577

Source: Research Findings (2021)

The outcomes in Table 4.3 specify that all the variables had a VIF values <10 and tolerance values >0.2 suggesting that Multicollinearity did not exist.

4.3.3 Heteroskedasticity test

Heteroskedasticity were checked by the Breusch-Pagan test. The null hypothesis was indicated by the variance of error terms being constant. Heteroskedasticity Test Results are shown in Table 4.4.

Table 4.4: Heteroskedasticity Results

Breusch-Pagan / Cook-Weisberg test for heteroscedasticity		
Ho: Constant variance		
Variable: fitted values		
chi2(1)	=	0.6947
Prob > chi2	=	0.6213

Source: Research Findings (2021)

The null hypothesis of Homoskedastic error terms is not rejected, according to the results in Table 4.4, which are supported by a 0.6213 p-value

4.3.4 Autocorrelation Test

Autocorrelation is a measure of how similar one time series was when compared to its lagged value across successive timings. The measure of this test was done using the Wooldridge test.

Table 4.5: Test of Autocorrelation

Wooldridge test for autocorrelation in panel data **H0: no first-order autocorrelation**
F(1, 39) = 0.441
Prob> F = 0.4962

Source: Research Findings (2021)

The null hypothesis of no serial association is not rejected by the results of Table 4.5 since the p-value is significant (p-value = 0.4962).

4.3.5 Stationarity Test

Stationarity test was utilized in determining if the statistical characteristics such as variance, mean, as well as autocorrelation change with the passage of time. Table 4.6 shows Levin-Lin Chu unit root test outcomes.

Table 4.6: Unit Root Test

Levin-Lin Chu unit-root test			
Variable	**Hypothesis**	**p value**	**Verdict**
FSD	Ho: Panels contain unit roots	0.0000	Reject Ho
Mobile banking	Ho: Panels contain unit roots	0.0000	Reject Ho
ATMs	Ho: Panels contain unit roots	0.0000	Reject Ho
Internet banking	Ho: Panels contain unit roots	0.0000	Reject Ho
Economic growth	Ho: Panels contain unit roots	0.0000	Reject Ho
Interest rates	Ho: Panels contain unit roots	0.0000	Reject Ho

Source: Research Findings (2021)

The null hypotheses that: Panels possess unit roots were rejected for all variables since the p values were less than 0.05, drawn from the outcomes in Table 4.6. This meant that all of the variables' panel data were stationary.

4.4 Correlation Results

Correlation analysis was carried out to establish the strength and direction of association between each predictor variable and the response variable. The results in Table 4.7 show the nature of relationships between the study variables in terms of magnitude and direction.

Table 4.7: Correlation Results

		Financial development	Mobile banking	ATMs	Internet banking	Economic growth	Interest rates
Financial development	Pearson Correlation	1					
	Sig. (2-tailed)						
Mobile banking	Pearson Correlation	.323*	1				
	Sig. (2-tailed)	.042					
ATMs	Pearson Correlation	.673**	.843**	1			
	Sig. (2-tailed)	.000	.000				
Internet banking	Pearson Correlation	.541**	.913**	.963**	1		
	Sig. (2-tailed)	.000	.000	.000			
Economic growth	Pearson Correlation	.248	.987**	.805**	.899**	1	
	Sig. (2-tailed)	.123	.000	.000	.000		
Interest rates	Pearson Correlation	.022	.203	.310	.269	.215	1
	Sig. (2-tailed)	.893	.208	.052	.094	.184	
*. Correlation is significant at the 0.05 level (2-tailed).							
**. Correlation is significant at the 0.01 level (2-tailed).							
c. Listwise N=40							

Source: Field data (2021)

The results in Table 4.8 reveal that mobile banking and FSD are positively and significantly correlated (r=0.323*) at 5 % significance level. This implies that mobile

banking and FSD change in the same direction. In addition, the results show that ATMs and FSD are positively and significantly correlated (r=0.673**) at 5 % significance level. This implies that both ATMs and FSD change in the same direction. Further, results show that internet banking and FSD are positively and significantly correlated (r=0.541) at 5 % significance level and this implies that internet banking and FSD change in the same direction. For the control variables, both economic growth and interest rate exhibited a positive but not significant relationship with FSD in Kenya.

4.5 Regression Results

Regression analysis was carried out to establish the extent to which FSD is explained by the selected variables. The regression results were presented in Table 4.8 to Table 4.10.

Table 4.8: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.866[a]	.751	.714	.0192636

a. Predictors: (Constant), Interest rates, Mobile banking, ATMs, Internet banking, Economic growth

Source: Field data (2021)

From the findings as represented by the adjusted R^2, the independent variables that were studied explained 75.1% of the variations in FSD in Kenya. This therefore means the five variables contributed to 75.1% of the variations in FSD in Kenya while other factors not studied in this research contribute 24.9%.

Table 4.9: ANOVA Analysis

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.038	5	.008	20.478	.000[b]
	Residual	.013	34	.000		
	Total	.051	39			

a. Dependent Variable: Financial development

b. Predictors: (Constant), Interest rates, Mobile banking, ATMs, Internet banking, Economic growth

Source: Field data (2021)

ANOVA statistics in Table 4.9 show that the data had a 0.000 level of significance hence this indicates that the data is ideal for making conclusions on the variables.

Table 4.10: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-3.025	.560		-5.398	.000
	Mobile banking	.419	.058	.414	3.319	.001
	ATMs	.498	.143	.539	3.474	.000
	Internet banking	.243	.001	.236	2.511	.017
	Economic growth	.184	.047	.172	1.406	.169
	Interest rates	.052	.140	.099	.370	.714

a. Dependent Variable: Financial development

Source: Field data (2021)

The coefficient of regression model was as below;

$$\mathbf{Y = -3.025 + 0.419X_1 + 0.498X_2 + 0.243X_3}$$

Where:

Y = FSD; X_1 = Mobile banking; X_2 =ATMs; X_3 = Internet banking;

4.6 Discussion of Research Findings

The objective was to establish the effect of financial technology on FSD in Kenya. The study utilized a descriptive design. The study depended mostly on published second had information from CBK and KNBS quarterly reports. The specific attributes of financial technology considered were; internet banking, mobile banking and ATMs. Whereas interest rate and economic growth were the control variables. Data was analyzed using both descriptive and inferential statistics. The results are discussed in this section.

Regression results revealed that mobile banking recorded positively and strong association with FSD in Kenya (β=0.419, p=0.001). These findings agree with those of Muli (2018) who found positive and significant impact of mobile banking on efficiency. However, these findings were inconsistent with those of Kamande (2018) who found that mobile banking does not significantly influence FSD.

The regression results also show that ATM transactions were positively and significantly related with FSD in Kenya (β=0.498, p=0.000). These findings agree with those of Abdulkadir (2019) who found a positive connection between ATMs and FSD. These findings are also consistent with those of King'ang'ai et al. (2016) who studied the impact of ATMs on performance of banks in Kenya and established a positive and significant effect.

In addition, results reveal that internet banking was positively and significantly related with FSD in Kenya (β=0.243, p=0.017). These findings agree with those of Kim et al. (2019) who indicated that internet banking affects the performance of banks. These findings were however inconsistent with those of Ogweno (2019) who found that there was no significant relationship between internet banking and FSD of MFIs.

For the control variables, both economic growth and interest rate exhibited a not significant positive effect. The R squared was 0.751. This implies that the selected predictor variables contributed 75.1% to variations in FSD. This study concluded that financial technology has a significant effect on FSD as the overall model was significant.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The chapter summarizes the previous chapter, draws conclusions and outlines the limitations that arouse. Additionally, it provides recommendation for policy makers and suggestions on further research.

5.2 Summary of Findings

The objective of this research was to assess how financial technology influence FSD in Kenya. The selected variables for investigation included internet banking, mobile banking, ATMs, interest rate and economic growth. A descriptive research design was selected to complete the research. Secondary data was gathered from CBK and KNBS and an analysis made using SPSS. Quarterly data for 10 years from 2011 to 2020 was obtained from the reports.

The first objective was to establish the effect of mobile banking on FSD in Kenya. The correlation results at 5 % significance level show that mobile banking recorded a positive association with FSD. This implies that improvement in mobile banking would lead to increase in FSD. Regression results (β=0.419, p=0.001) show that there was a positive and significant effect of mobile banking on FSD in Kenya.

The second objective was to examine the effect of ATMs on FSD in Kenya. The correlation results at 5 % significance level show that ATMs record a positive association with FSD. This implies that improvement in agency banking would lead to increase in FSD. Regression results (β=0.498, p=0.000) show that there was a positive and significant effect of ATMs on FSD in Kenya.

The third objective was to assess the effect of internet banking on FSD in Kenya. The correlation results at 5 % significance level show that internet banking recorded a positive correlation with FSD. This implies that improvement in internet banking would lead to increase in FSD. Regression results β=0.243, p=0.017) show that there was a positive and significant effect of internet banking on FSD in Kenya.

The fourth objective was to examine the effect of economic growth on FSD in Kenya. The correlation results at 5 % significance level show that economic growth recorded a positive correlation with FSD but the association was not significant. This implies that improvement in economic growth would lead to increase in FSD but not significantly. Regression results (β=0.184, p=0.169) show that there was a positive but not significant effect of economic growth on FSD in Kenya.

The fifth objective was to examine the effect of interest rate on FSD in Kenya. The correlation results at 5 % significance level show that interest rate recorded a positive but not significant correlation with FSD. This implies that an increase in the rate of interest would not lead to a significant change in FSD. Regression results (β=0.052, p=0.714) show that there was a positive but not significant effect of interest rate on FSD in Kenya.

5.3 Conclusions

The study purpose of the research was to find out the association between financial technology and FSD. The study results showed that mobile banking recorded a positive and significant effect on FSD. This may imply that banks which have adopted mobile banking in a large scale are likely to record a high level of FSD compared with banks with less mobile banking adoption. The study concludes that mobile banking enhances FSD in Kenya.

The findings further showed that ATMs recorded a positive as well as substantial effect on FSD in Kenya. This may imply that an increase in ATM transactions in an economy is likely to lead to enhancement in financial development of that economy. The concept can mean that an increase in ATM transactions implies a rise in consumption and demand for goods and services.

The study results further indicated that internet banking recorded a positive and substantial effect on FSD in Kenya. This may imply that banks which have adopted internet banking in a large scale are likely to record a high level of FSD compared with banks with less internet banking adoption. The study concludes that internet banking enhances FSD in Kenya.

5.4 Recommendations for Policy and Practice

From the study findings, mobile banking recorded a positive and significant effect on FSD in Kenya. The study therefore recommends that policy makers and practitioners in the financial sector should work on increasing their scale of mobile banking as this will contribute to enhancement of FSD. The policy makers such as the CBK should create a conducive environment for banks to conduct mobile banking activities.

Agency banking recorded a significant effect on FSD in Kenya. Therefore, the study recommends that the CBK which is the regulator should come with policy guidelines on how banks should adopt agency banking. They should also create a conducive environment making it easy for banks to adopt agency banking. Furthermore, management and directors of banks in Kenya should work on ensuring they have agency banking outlets in the different parts of the country.

Further, internet banking was found to have a significant and positive impact on FSD. The study therefore recommends that management and directors of commercial banks

in Kenya should ensure that clients are able to transact through internet banking without security risks as this will lead to higher levels of FSD. The government should work on enhancing internet coverage to make this a reality.

5.5 Limitations of the Study

The focus was on some of the elements that are thought to affect the FSD in Kenya. The study delved on five explanatory variables in particular. However, there are other factors that are likely to influence FSD. These factors include other financial technology services not considered in this study such as agency banking, MPesa among others.

The research used secondary quantitative data. The study also ignored qualitative data that may explain the other factors that influence the relationship between financial technology and banks' FSD. Qualitative methods like focus groups, open-ended surveys, and interviews can aid in the development of more definite outcomes.

The study focused on a ten-year period (2011 to 2020). It's unclear whether the results will last for a longer period of time. It is also unclear whether similar results will be achieved after 2020. In order to account for key economic events, the study should have been conducted over a longer period of time.

The researchers utilized an ordinary least square regression model to analyze the data. Because of the limitations of employing regression models, such as deceptive and erroneous results that cause the value of the variable to change, it was impossible to generalize the conclusions of the research with accuracy. In addition, findings may be different if data was integrated in the regression.

5.6 Suggestions for Further Research

The study findings revealed an R square of 75.1%. This implies that there are other factors that affect FSD in Kenya that were not addressed by the research. Other researches ought thus to focus on other factors for example; agency banking, political stability, financial inclusion, poverty levels, among other aspects that affect FSD in Kenya.

The study was limited to the financial sector in Kenya. Additional research on other economies such as the East Africa community member countries should be conducted, according to the study's suggestions. Future research should look into how financial technology affects other factors besides the FSD, such as financial inclusion, economic growth and poverty eradication.

Because of the readily available data, the focus of this research was drawn to the last ten years. Past studies may span a longer time period, such as twenty or thirty years, and might have a significant impact on this study by either complementing or contradicting its conclusions. A longer study has the advantage of allowing the researcher to catch the effects of business cycles including recession and booms.

Finally, this research relied on a regression model, with its own shortcomings, such as misleading results and errors when a variable is changed. Future study should concentrate on models such as the Vector Error Correction Model (VECM) in order to investigate the numerous relationships between financial technology and the FSD.

REFERENCES

Abdulkadir, I. (2018). *Effect of financial technology on financial performance of commercial banks in Kenya*, Unpublished MSc Research Project, University of Nairobi

Abdulkarim, F., & Ali, H. (2019). Financial inclusions, financial stability, and income inequality in OIC countries: A GMM and quantile regression application. *Journal of Islamic Monetary Economics and Finance*, *5*(2), 419-438

Alatrash, Y., Leff, D., Minten, T., Soupre, M., & Van Schoot, D. (2014). *Financial Development and Macroeconomic Volatility*. Mimeo, Barcelona Graduate School of Economics and Universitat Pompeu Fabra.

Allen, F., &Santomero, A.M. (2001). What do financial intermediaries do? *Journal of Banking & Finance*, 25, 271–294.

Arner, S. (2015). FinTech in China: From the Shadows?. *Journal of Financial Perspectives*, 35, 78-91

Athanasoglou, P.,Brissimis, S., & Delis, M. (2005). Bank-Specific, Industry-Specific and Macroeconomics Determents of Bank Profitability, *Bank of Greece*, No. 25

Ayadi, R., Arbak, E. & Naceur S. (2013a). Financial development, bank efficiency and economic growth across the Mediterranean, MEDPRO Technical Paper No. 30, MEDPRO FP7 project.

Baba, F., & Nasieku, A.M. (2001). What do financial intermediaries do? *Journal of Banking & Finance*, 25(3), 271–294.

Babajide, A. A., Adegboye, F. B., Omankhanlen, A. E., (2015). Financial Inclusion and economic growth in Nigeria. *International Journal of Economics and Financial Issues*, 5(3).

Bames. (2014). Internet Banking, *Journal of Financial Services Research*, 29, 95-117.

Burns, N. & Burns, S. (2008). *The Practice of Nursing Research: Conduct, Critique and Utilization*: 5th Edition: St Louis, Elsevier Saunders

Central Bank of Kenya (2018). *Statistical bulletin*. Nairobi: Government press.

Central Bank of Kenya (2019). *Statistical bulletin*. Nairobi: Government press.

Christopher, G. C., Mike, L. Visit & Amy, W. A (2005). Logit Analysis of Electronic Banking in New Zealand. *International Journal of Bank Market, 24*, 360- 383

Cihak, M., & Singh, P., (2013). *An analysis of national financial inclusion strategies.* Washington, D.C: World Bank.

Cooper, D. R., & Schindler, P. S. (2008). *Business research methods*. New Delhi: Tata McGraw-Hill Publishing Company Limited

Crook, H. (2008). *Open Services Innovation*. London: John Wiley & Sons

David-West, O. (2015). The path to digital financial inclusion in Nigeria: Experiences of Firstmonie. *Journal of Payments Strategy & Systems, 9(*4), 256-273

Davila, T. (2014).*The innovation strategy big companies should pursue*. Harvard Business School Publishing

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–339

Demirguc, A. K. & Klapper, L. (2012). Measuring financial inclusion: Explaining variation in use of financial services across and within countries. *Brookings Papers on Economic Activity, 1*(1), 279-340.

Demirguc-Kunt, A., Klapper, L., Singer, D., Ansar, S., & Hess, J. (2018). The global Findex database 2017: Measuring financial inclusion and the fintech revolution.The World Bank.

Dewatripont, D., Rochet, C., &Tirole,W. (2010). Financial intermediation and delegated monitoring. *Review of Economic Studies,*51, 393-414

Freytag, A., & Fricke, S. (2017). Sectoral linkages of financial services as channels of economic development—An input–output analysis of the Nigerian and Kenyan economies, *Review of Development Finance,* 7(1), 36-44

Government of Kenya (2007). Economic Surveys, various Issues. Nairobi. Government Printer

Gretta, S.A.A. (2017). Financial inclusion and growth. *The Business and Management Review, 8*(4), 434-445.

Hannig, A., & Jansen, S. (2010). *Financial inclusion and financial stability: Current policy issues*. Asian Development Bank Institute Working Paper

Kemboi, B. (2018). *Effect of financial technology on financial performance of commercial banks in Kenya,* Unpublished MBA Research Project, University of Nairobi

Khan, J. A. (2008).*Research Methodology*. New Delhi. APH Publishing Corporation

Khan, W. A., & Sattar, A. (2014). Impact of Interest Rate Changes on the Profitability of four Major Commercial Banks in Pakistan. *International Journal of Accounting and Financial Reporting*, *4*(1), 142-147

Kim, D. W., Yu, J. S., & Hassan, M. K. (2018). Financial inclusion and economic growth in OIC countries. Research in International Business and Finance, 43, 1e14.

Kim, M., Zoo, H., Lee, H., & Kang, J. (2019). Mobile financial services, financial inclusion, and development: A systematic review of academic literature, *The Electronic Journal of Information Systems in Developing Countries, 84*(5), 1-17

Klapper, L., (2016). *Financial Inclusion has a big role to play in reaching the SDG's* [Online]. Washington DC: Consultative Group to Assist the Poor.

Kohali, A. &Sheleg, A. (2011). *Alternative banking channels*. Tefen Tribune, Spring Issue, 2011.

Le, T., Chuc, A., & Taghizadeh-Hesary, F. (2019). Financial inclusion and its impact on financial efficiency and sustainability: Empirical evidence from Asia, *Borsa Istanbul Review*, 19(4), 310-322

Lee, K. S., Lee, H. S. and Kim, S. Y. (2007), Factors Influencing the Adoption Behavior of Mobile Banking: A South Korean perspective, *Journal of Internet Banking and Commerce*, 12, 22-28

Lenka, S.K., & Sharma, R. (2017). Does financial inclusion spur economic growth in India? *The Journal of Developing Areas*, *51*(3), 215-228.

Levine, R. Loayza, N. & Beck, T. (2012). Financial intermediation and growth: Causality and causes. *Journal of Monetary Economics,* 46(1), 31-77.

Mehrotra, A., & Yetman, J. (2015). Financial inclusion-issues for centralbanks. BIS Quarterly Review. London: Department for Business Innovation and Skills.

Mises, J. (1912). Financial Development, Growth, and the Distribution of Income. *Journal of Political Economy,* 98 (5): 1076-1107.

Ndiang'ui, J. (2019). *Effect of selected macro-economic variables on financial development in Kenya*. Unpublished MBA Project ,University of Nairobi

Neaime, S., & Gaysset, I. (2018). Financial inclusion and stability in MENA: Evidence from poverty and inequality. *Finance Research Letters*, *24(1*), 230-237

Ochieng, E. (2018). *Effect of government domestic borrowing on financial development in Kenya.* Unpublished MBA research project, University of Nairobi

Ongori, H. & Migiro, S.O. (2010). Information and Communication technology adoption: a literature review. *Journal of Chinese Entrepreneurship,* 93-104.

Patrick, H.T. (1966). Financial Development and Economic Growth in Underdeveloped countries', *Economic Development and Cultural Change*, 14(1), 174-189.

Quinn, D. & Toyoda A. (2008). Does Capital Account Liberalization Lead to Growth? *Review of Financial Studies,* 12(3), 11-24

Rasheed, B., Law, S.-H., Chin, L., & Habibullah, M. S. (2016). The role of financial inclusion in financial development: International evidence. *Abasyn University Journal of Social Sciences, 9(*2), 330-348

Robinson, L., (2009). *A summary of diffusion of innovations.* Retrieved from www.enablingchange.com.au/summary_diffusion_Theory

Rogers, E. M. (1995). A prospective and retrospective look at the diffusion model. *Journal of Health Communication*, 9(1), 13-19.

Rogers, E. M., (1962). *The diffusion of innovations.* Free Press: New York.

Rogers, E. M., (2003). *The diffusion of Innovation (5th Edition).* Free Press: New York.

Roubini, N. & Bilodeau, J. (2008).*The Financial Development Index: Assessing the World's Financial Systems.* The financial development report 2008. Geneva Switzerland: World Economic Forum.

Sheleg, A. & Kohali, A (2011). *Alternative banking channels*. Tefen Tribune, Spring Issue, 2011.

Standley, S. (2008). What are the determinants of financial market development in sub-Saharan Africa. *Private Sector Development*, 12(1) 17-26.

Stiroh, K.J. (2001). Investing in Information Technology: Productivity Payoffs for U.S. Industries. *Current Issues in Economics & Finance*, 6, 1-6

Triki & Faye (2013). *Financial inclusion in Africa*. Ghana: African Development Bank.

Wernerfelt B. (1984). Alternative methods of learning and process improvement in manufacturing, *Journal of Operations Management*, 16, 1-20.

World Bank (2017). *The Findex Global Database 2017* [Online]. Washington D.C: World Bank. Available from: datatopics.worldbank.org/financialinclusion/ [Accessed 20 October 2019].

Zins, A., & Weill, L. (2016). The determinants of financial inclusion in Africa, *Review of Development Finance*, *6*(1), 46-57

APPENDIES

Appendix I: Research Data

Quarter	Financial development	Mobile banking	Mobile banking	'ATMs'	ATMs	Internet banking	Internet banking	Economic growth	Interest rates
1.	0.2183	9707920.0000	16.0885	1754.0000	7.4697	1022.0000	6.9295	0.0919	8.4167
2.	0.2264	10536700.0000	16.1704	1818.0000	7.5055	1032.0000	6.9393	0.0938	8.0833
3.	0.2157	14427767.0000	16.4847	1886.0000	7.5422	1056.0000	6.9622	0.0968	7.7500
4.	0.2314	16085300.0000	16.5934	1948.0000	7.5746	1063.0000	6.9689	0.0984	7.2500
5.	0.2617	17016067.0000	16.6497	2021.0000	7.6113	1082.0000	6.9866	0.0985	6.9167
6.	0.2859	17942700.0000	16.7027	2060.0000	7.6305	1122.0000	7.0229	0.0987	6.7500
7.	0.2827	18604200.0000	16.7389	2097.0000	7.6483	1140.0000	7.0388	0.0993	6.0000
8.	0.2883	19286900.0000	16.7749	2116.0000	7.6573	1161.0000	7.0570	0.1001	6.0000
9.	0.3120	18955134.0000	16.7576	2163.0000	7.6793	1167.0000	7.0622	0.1001	5.8333
10.	0.3177	19673300.0000	16.7948	2207.0000	7.6994	1200.0000	7.0901	0.1028	6.0833
11.	0.2911	19556667.0000	16.7888	2246.0000	7.7169	1225.0000	7.1107	0.1037	6.5000
12.	0.3029	20443334.0000	16.8332	2285.0000	7.7341	1272.0000	7.1483	0.1044	15.1667
13.	0.2099	21849900.0000	16.8997	2322.0000	7.7502	1274.0000	7.1499	0.1045	18.0000
14.	0.3146	23412834.0000	16.9688	2354.0000	7.7639	1288.0000	7.1608	0.1053	18.0000
15.	0.3229	24036667.0000	16.9951	2396.0000	7.7816	1313.0000	7.1801	0.1056	15.3333
16.	0.3315	24885434.0000	17.0298	2415.0000	7.7895	1342.0000	7.2019	0.1057	11.6667
17.	0.3185	26027067.0000	17.0746	2468.0000	7.8112	1356.0000	7.2123	0.1063	9.5000
18.	0.3262	25961167.0000	17.0721	2543.0000	7.8411	1384.0000	7.2327	0.1065	8.8333

19.	0.3379	26286334.0000	17.0846	2490.0000	7.8200	1416.0000	7.2556	0.1071	8.5000
20.	0.3421	25397234.0000	17.0502	2509.0000	7.8276	1443.0000	7.2745	0.1071	8.5000
21.	0.3214	25514334.0000	17.0548	2527.0000	7.8348	1444.0000	7.2752	0.1072	8.5000
22.	0.3271	26368834.0000	17.0877	2569.0000	7.8513	1452.0000	7.2807	0.1072	8.5000
23.	0.3359	27033300.0000	17.1126	2579.0000	7.8552	1472.0000	7.2944	0.1083	8.5000
24.	0.3427	28081900.0000	17.1506	2578.0000	7.8548	1523.0000	7.3284	0.1094	8.5000
25.	0.3298	29760867.0000	17.2087	2618.0000	7.8702	1527.0000	7.3311	0.1097	8.5000
26.	0.3149	31373334.0000	17.2615	2623.0000	7.8721	1530.0000	7.3330	0.1114	9.0000
27.	0.3192	32842667.0000	17.3072	2601.0000	7.8637	1536.0000	7.3369	0.1114	11.5000
28.	0.3046	34425000.0000	17.3543	2611.0000	7.8675	1541.0000	7.3402	0.1121	11.5000
29.	0.3111	33517667.0000	17.3276	2615.0000	7.8690	1524.0000	7.3291	0.1126	11.5000
30.	0.3029	34223000.0000	17.3484	2590.0000	7.8594	1526.0000	7.3304	0.1136	10.8333
31.	0.3072	35149334.0000	17.3751	2583.0000	7.8567	1516.0000	7.3238	0.1140	10.5000
32.	0.3262	36592734.0000	17.4154	2575.0000	7.8536	1518.0000	7.3251	0.1165	10.5000
33.	0.2813	38533434.0000	17.4670	2569.0000	7.8513	1515.0000	7.3232	0.1174	10.0000
34.	0.2790	41532700.0000	17.5420	2551.0000	7.8442	1513.0000	7.3218	0.1179	10.0000
35.	0.2795	43481367.0000	17.5878	2538.0000	7.8391	1512.0000	7.3212	0.1188	10.0000
36.	0.2730	46454934.0000	17.6540	2524.0000	7.8336	1505.0000	7.3165	0.1191	10.0000
37.	0.2765	46898434.0000	17.6635	2515.0000	7.8300	1516.0000	7.3238	0.1210	9.5000
38.	0.2756	50348034.0000	17.7345	2518.0000	7.8312	1519.0000	7.3258	0.1224	9.0000
39.	0.2745	54787500.0000	17.8190	2531.0000	7.8364	1555.0000	7.3492	0.1228	9.0000
40.	0.2753	57564434.0000	17.8684	2462.0000	7.8087	1597.0000	7.3759	0.1232	9.0000