

**EFFECT OF FINANCIAL TECHNOLOGIES ON FINANCIAL SUSTAINABILITY OF
DEPOSIT TAKING MICROFINANCE BANKS IN KENYA**

BY

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**MASTER OF SCIENCE IN COMMERCE
(FINANCE AND ACCOUNTING)**

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE AWARD OF MASTER OF SCIENCE IN COMMERCE
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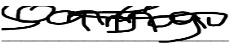
JUNE 2025

DECLARATION

I declare that this dissertation is my original work and has not been previously published or submitted elsewhere for award of a degree. I also declare that this contains no material written or published by other people except where due reference is made and author dully acknowledged.

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ABSTRACT

The financial sustainability of deposit-taking (DT) microfinance banks in Kenya has been a growing concern despite the increasing adoption of financial technologies (fintech). While fintech innovations like online lending platforms, digital payment systems and mobile banking, are expected to enhance efficiency and expand financial inclusion, their impact on sustainability remains unclear. Recent trends indicate a decline in key financial sustainability indicators, consisting Return on Assets and Return on Equity, raising questions about the effectiveness of fintech adoption. Many microfinance banks continue to face operational challenges, including high implementation costs, low customer adoption rates, and cybersecurity vulnerabilities. This study aims to assess the effect of financial technologies on the financial sustainability of DT microfinance Kenyan banks. The general objective of the study was to examine the effect of financial technologies on financial sustainability of deposit taking microfinance banks in Kenya. The specific objectives were to examine the effect of online lending platforms, mobile banking, card payment systems and internet banking on financial sustainability of deposit taking Kenyan microfinance banks. The research was anchored on resource-based view, diffusion of innovation theory, and unified theory of acceptance and use of technology. The research used an explanatory research design. The target population was all the 14 deposit taking Kenyan microfinance banks. The study adopted a census approach and hence the whole population will be included in the study. The research employed secondary data, which was obtained from Bank supervision reports by CBK as well as the annual financial statements of individual microfinance banks in Kenya. The study covered the period between 2019 and 2023. Panel data was generated using a data collection checklist. The study used both descriptive and inferential statistics in data analysis with the assistance of STATA 14. Descriptive statistics included mean, percentages, frequencies, standard deviation, as well as minimum and maximum values. Inferential statistics included panel regression analysis. Tables and figures, such as line graphs, were used to present the results. The study found that mobile banking has a positive and significant effect on the financial sustainability of microfinance banks in Kenya. In addition, the study established that online lending platforms have a positive but statistically insignificant effect on the financial sustainability of microfinance banks in Kenya. Further, the study revealed that card payment systems have a positive and statistically significant effect on the financial sustainability of microfinance banks in Kenya. Moreover, the study found that internet banking has a statistically significant negative effect on the financial sustainability of microfinance banks in Kenya. The study concludes that, in Kenya's microfinance banks, mobile banking and card payment systems significantly enhance financial sustainability, online lending platforms have an insignificant positive effect, and internet banking exerts a significant negative impact. The study recommends expanding mobile banking and card systems, improving online lending adoption, and reassessing internet banking strategies to enhance financial sustainability in microfinance banks.

DEDICATION

I devote this project to my dad Anthony Munanga and my mum Benina Mmbalasi for their encouragement and financial support throughout the entire period. My success on this academic journey will be a way of making them proud parents. I also devote this project to my grandfather Frentine Munanga for the good thought he has towards my academic life and his prayers too.

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TABLE OF CONTENTS

DECLARATION	ii
ABSTRACT	iii
TABLE OF CONTENTS	iv
LIST OF TABLES	x
LIST OF FIGURES	xi
ABBREVIATIONS AND ACRONYMS	xii
OPERATIONAL DEFINITION OF TERMS	xiv
CHAPTER ONE	1
INTRODUCTION	1
1.1 Background of the Study	1
1.1.1 Financial Technologies	3
1.1.2 Financial Sustainability.....	6
1.1.3 Deposit-Taking Microfinance Banks in Kenya	7
1.2 Statement of the Problem.....	9
1.3 Research Objectives.....	10
1.3.1 General Objective	10
1.3.2 Specific Objectives	11
1.4 Research Questions.....	11
1.5 Significance of the Study	11
1.5.1 Kenyan microfinance banks’ management.....	12
1.5.2 Government of Kenya and policymakers	12
1.5.2 Other Researchers and Academicians.....	12

1.6 Scope of the Study	13
CHAPTER TWO	14
LITERATURE REVIEW	14
2.1 Introduction.....	14
2.2 Theoretical Review	14
2.2.1 Unified Theory of Acceptance and Use of Technology	14
2.2.2 Diffusion of Innovation Theory	16
2.2.3 Resource-Based View	18
2.3 Empirical Review.....	20
2.3.1 Mobile Banking and Financial Sustainability.....	20
2.3.2 Online Lending Platforms and Financial Sustainability	23
2.3.3 Card Payment Systems and Financial Sustainability.....	26
2.3.4 Internet Banking and Financial Sustainability.....	29
2.4 Research Gaps.....	33
2.5 Conceptual Framework.....	38
2.6 Operationalization of Study Variables.....	39
CHAPTER THREE	41
RESEARCH METHODOLOGY	41
3.1 Introduction.....	41
3.2 Research Design.....	41
3.3 Target Population.....	41
3.4 Sample Size and Sampling Technique.....	42
3.5 Data Collection Instruments	42

3.6 Data Collection Procedures.....	43
3.7 Data Analysis and Presentation	43
3.7.1 Diagnostic Tests.....	44
3.8 Ethical Considerations	47
CHAPTER FOUR.....	49
RESEARCH FINDINGS AND DISCUSSIONS	49
4.1 Introduction.....	49
4.2 Descriptive Statistics.....	49
4.3 Diagnostic Tests.....	52
4.3.1 Linearity Test.....	53
4.3.2 Normality Test	60
4.3.3 Multicollinearity Test.....	61
4.3.4 Heteroscedasticity Test	63
4.3.5 Hausman Test.....	64
4.4 Panel Regression Model	65
CHAPTER FIVE	72
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	72
5.1 Introduction.....	72
5.2 Summary of the Findings.....	72
5.2.1 Mobile Banking and Financial Sustainability.....	72
5.2.2 Online Lending Platforms and Financial Sustainability	74
5.2.3 Card Payment Systems and Financial Sustainability.....	75
5.2.4 Internet Banking and Financial Sustainability.....	76

5.3 Conclusion	77
5.4 Recommendations.....	79
5.5 Recommendations for Further Research.....	81
REFERENCES.....	83
APPENDICES.....	94
Appendix I: Data Collection Checklist.....	94
Appendix II: NACOSTI Permit.....	95

LIST OF TABLES

Table 2. 1: Operationalization of Variables	40
Table 4. 1: Descriptive Statistics	50
Table 4. 2: Shapiro Wilk Test.....	61
Table 4. 3: Collinearity Statistics.....	62
Table 4. 4: Breusch-Pagan Test for Heteroskedasticity.....	63
Table 4. 5: Hausman Test	65
Table 4. 6: Panel Regression Results	67

LIST OF FIGURES

Figure 2. 1: Conceptual Framework	38
Figure 4. 1: Scatter Plot for Card Payment Systems and Financial Stability	Error! Bookmark not defined.
Figure 4. 2: Scatter Plot for Mobile Banking and Financial Stability	Error! Bookmark not defined.
Figure 4. 3: Scatter Plot for Online Lending Platforms and Financial Stability.	Error! Bookmark not defined.
Figure 4. 4: Scatter Plot for Internet Banking and Financial Stability.....	58

ABBREVIATIONS AND ACRONYMS

CBK:	Central Bank of Kenya
CBN:	Central Bank of Nigeria
CPS:	Card Payment Systems
DT-MFIs:	Deposit-Taking Microfinance Institutions
EMV:	Europay, Mastercard, and Visa
GDP:	Gross Domestic Product
IB:	Internet Banking
MB:	Mobile Banking
MFBs:	Microfinance Banks
MFIs:	Microfinance Institutions
NACOSTI:	National Commission for Science, Technology, and Innovation
NDIC:	Nigeria Deposit Insurance Corporation
OLP:	Online Lending Platforms
OLS:	Ordinary Least Squares
OSS:	Operational Self-Sufficiency
ROA:	Return on Assets
ROE:	Return on Equity
SMEs:	Small and Medium-Sized Enterprises

- TAM:** Technology Acceptance Model
- TPB:** Theory of Planned Behavior
- UTAUT:** Unified Theory of Acceptance and Use of Technology
- VIF:** Variance Inflation Factor

OPERATIONAL DEFINITION OF TERMS

Card Payment Systems: These refer to systems that facilitate transactions using debit, credit, or prepaid cards, measured by the value of card transactions (the total monetary transaction value processed through these systems) (Bousrih, 2023).

Financial Sustainability: This entails that an institution proves financial sustainability when it covers all business expenses over a long period by measuring Operational Self-Sufficiency ratio (Naz & Ali, 2019).

Financial Technologies: These provides that by bringing digital technologies such as mobile banking and online lending into financial services operations the sector can make services run smoother and less expensive while making service access easier and faster to deliver (Mia, 2023).

Internet Banking: This refers to the system that allows customers to access their online banking platform and to manage both financial activities and purchases measured as total money spent through internet banking (Chukwu & Molokwu, 2022).

Mobile Banking: This provides that customers perform financial actions on their mobile devices and the survey considers transaction amounts performed in mobile banking (Abimbola, Adegoke & David, 2024).

Online Lending Platforms: These refer to platforms that enable the disbursement of loans through digital means, measured by the value of online loans (the total monetary value of loans granted via these platforms) (Chuc, Atayah & Ozer, 2023).

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Microfinance banks are essential for promoting economic development by offering financial assistance to marginalized populations, including small businesses and low-income individuals that often lack access to traditional banking channels. Globally, approximately 1.4 billion people benefit from the services offered by microfinance institutions (Parvin & Cao, 2020; World Bank, 2023). These services range from savings accounts to small loans and enable individuals and enterprises to engage in productive economic activities, thereby contributing substantially to the GDP of a nation. A Microfinance Information Exchange (2022) report highlights that microfinance banks contribute over \$60 billion annually to the GDP of developing nations. In particular, SMEs serve as key drivers of this economic growth, leveraging microfinance resources to expand their operations and create jobs.

Moreover, microfinance banks effectively lower poor communities' living conditions. According to Chauhan and Kumar (2024), microfinance banks help poor communities start businesses, gain independence, and live better by offering saving services, loans, and financial education. The growth of financial technologies helps microfinance banks balance their financial stability while providing better service to their users. These system tools raise productivity levels and widen service areas to help microfinance banks better support local communities despite the challenges of limited resources. Technology integration helps the banks make better strategic decisions and ensures their business survives for the future.

Globally, financial technology has played an important role in reshaping the financial sustainability of microfinance banks. According to Ozili (2023), FinTech innovations like digital

payment systems, mobile banking, and online lending platforms have enhanced operational efficiency, increased financial inclusion, and reduced transaction costs in financial institutions. In Asia, digital financial services have widely been adopted in microfinance institutions, improving service delivery and customer experience (ADB, 2022). A study by Liu and Chen (2023) in China found that online lending platforms and mobile banking significantly contributed to financial sustainability by expanding the customer base and enhancing loan repayment efficiency. In Latin America, Gonzalez et al. (2021) established that digital financial solutions enabled microfinance banks to extend credit to previously unbanked populations, thus improving their profitability and long-term stability. These global perspectives highlight the transformative effect of financial technology in enhancing the sustainability of microfinance institutions.

In Africa, financial technology has similarly contributed to the sustainability of microfinance banks by promoting accessibility and efficiency. A study by Ndlovu and Mashamba (2023) in South Africa revealed that mobile banking and card payment systems reduced operational costs and improved financial sustainability in microfinance institutions. In Nigeria, Okafor and Adegbite (2022) established that the adoption of online lending platforms significantly boosted loan repayment rates, reducing the risk of default and enhancing microfinance institutions' sustainability. Furthermore, a study conducted in Ghana by Asante and Amankwah (2021) highlighted that financial technology improved the outreach of microfinance institutions, allowing them to serve previously marginalized communities while maintaining financial stability. These results highlight the significance of FinTech in supporting the financial sustainability of microfinance banks in African economies, particularly in enhancing financial inclusion, operational efficiency, and long-term viability.

In Kenya, researches on financial technologies and performance have centered on various banking segments. Mokaya (2020) examined the impact of financial technology on the financial performance of Kenyan Tier II banks, while Maina (2024) explored digital transformation in commercial banks. However, limited research has been conducted specifically on financial technologies effect on the financial sustainability of DTMFBs. Unlike commercial banks, DTMFBs primarily serve financially vulnerable populations, making their sustainability a crucial issue. This research aims to bridge this gap by analyzing how financial technologies influence financial sustainability in Kenyan DTMFBs, specifically examining the role of internet banking, card payment systems, online lending platforms, and mobile banking. The study will provide empirical evidence on how these technologies contribute to operational self-sufficiency and long-term financial stability in the microfinance sector.

1.1.1 Financial Technologies

Through digital technology, FinTech offers advanced services that simplify operations enhance customer reach and expand banking access to deserving communities (Mia, 2023). Through technological solutions microfinance organizations help people who lack banking options most notably small businesses and low-income families to gain access to needed services (Dasilas, 2023). Through mobile banking and online lending platforms combined with card payments and internet banking services MFIs offer affordable digital banking services to everyone in need.. As observed by Banna and Yarovaya (2022), these technologies enable people to complete transactions from anywhere and handle their bank accounts on remote devices.

The microfinance sector experiences clear advantages through financial technologies which enhance service delivery both for underserved communities and make banking processes operate faster (Agboola & Eze, 2023). Through digital services banks can serve overlooked customers

from small towns and rural areas while cutting costs and doing work faster (Dang & Vu, 2020). They help make basic banking functions easier and make basic financial tools available at lower costs (Dasilas, 2023). Furthermore, FinTech allows microfinance institutions to enhance customer experiences, better manage risks, and achieve greater outreach and impact for small businesses and low-income individuals (Benami & Carter, 2021). Nonetheless, problems like security concerns, digital fraud and the exclusion of populations without internet or smartphone access remain significant barriers (Shaikh, 2021). Moreover, the rapid evolution of financial technologies poses regulatory challenges, making it difficult for policymakers to adapt to the constantly changing financial landscape.

Different researches carried out in various parts of the globe and in Kenya have conceptualized financial technologies differently. For instance, Dasilas (2023) conceptualized financial technology regarding internet banking, card payment systems, mobile banking and online lending systems. Similarly, Okoro, Nnam and Etukudo (2024) measured financial technology in terms of mobile banking, automated teller machines, online lending systems and internet banking. In Kenya, Wanyonyi and Ngaba (2021) looked at financial technology in terms of digital funds transfer, credit payment systems, internet banking and mobile banking.

Mobile Banking is a key financial technology that enables clients to access and manage their bank accounts via mobile devices like feature phones and smartphones (Dang & Vu, 2020). Users can perform many banking operations remotely using this technology including money transfer, balance review, bill payments and loan application (Dasilas, 2023). Mobile banking services on smartphones enable access to financial services that improve convenience and promote banking reach to communities without banks (Banna and Yarovaya 2022).

Microfinance banks use digital systems to let people take out loans online through web-based technology according to Mia (2023). Digital platforms simplify all phases of lending from loan submission to payments which provides borrowers a modern way to handle their loan transactions instead of standard loan systems (Benami & Carter, 2021). In microfinance, online lending platforms are particularly valuable as they enable marginalized groups, involving those who live in remote areas, to access credit without needing to visit physical bank branches. Agboola and Eze (2023) indicate that by utilizing advanced technologies like machine learning and artificial intelligence, these platforms assess creditworthiness efficiently, often leveraging alternative data like mobile money transactions or utility payment histories. They enhance operational efficiency for microfinance banks by reducing administrative costs and processing times.

Through card payment systems microfinance banks let customers use electronic payment methods linked to their account to make managed transactions with debit, credit, and prepaid cards (Ndungu & Moturi, 2020). These systems enable customers to spend digital money without cash for shopping and banking transactions plus they provide both parties with protection. Microfinance banks use payment cards to expand monetary inclusion by giving small companies and low-income people better ways to pay with modern technology (Shaikh, 2021). These systems connect to Visa and Mastercard networks that use EMV chips and contactless payment systems to protect money transfers (Dang & Vu, 2020).

Internet Banking is a service that allows users to access and manage their bank accounts online, via a web browser or mobile app, from any location with internet access (Banna & Yarovaya, 2022). Through internet banking, customers can carry out a variety of financial operations like managing investments, transferring funds, checking account balances and making

payments (Dasilas, 2023). This technology offers a high convenience level and flexibility, allowing users to perform banking tasks at any time, and making banking services more accessible to people who may be limited to access physical branches hence contributing to financial inclusion (Wanyonyi & Ngaba, 2021).

1.1.2 Financial Sustainability

Financial sustainability requires organizations to handle resources properly to achieve and maintain financial stability throughout multiple years (Naz & Ali, 2019). The organization needs consistent income to handle existing expenses and create plans for required future money. To achieve financial stability organizations must plan carefully with their resources while finding multiple sources of income to decrease reliance on one main funding source (Memon, Akram & Yasmin, 2022). Building reliable savings while running operations better and looking for new ways to make money creates financial stability. According to Awaworyi (2020), financial sustainability allows a company to operate, grow, and achieve its objectives without persistent risks of financial instability or over-reliance on external funding.

While financial sustainability focuses on long-term resource management and operational continuity, it differs from financial performance and financial stability in terms of measurement parameters (Jelincic & Sveb, 2021). Financial performance is typically measured using short-term indices like profitability, return on assets, and liquidity ratios, which evaluate how efficiently an organization uses its resources to get profits. Financial stability depends on examining debt-to-equity ratios, capital amount and risk tolerance levels to show how an organization survives economic stress situations (Comite & Miculescu, 2022). In contrast, financial sustainability reviews how well an organization manages multiple income streams

through separate funds plus keeps enough reserves for future needs (Cuadrado-Ballesteros, 2022).

Different studies conducted in microfinance banks around the world and in Kenya have used different financial sustainability measures. As indicated by Gleibner, Günther and Walkshausl (2022), financial sustainability measures include firm expansion, the organization's capacity to endure and the total amount of profits risk exposure. In addition, Uchenna and Isibor, A. (2020) looked at financial sustainability in terms of return on asset (profitability estimate) and operational self-sufficiency (efficiency estimate). According to Maeenuddin and Jermstiparsert (2024), the measures of financial sustainability include OSS ratio, ROE and ROA. Similarly, Githaiga (2022) conceptualized financial sustainability in terms of return on equity, financial self-sufficiency, as well as return on asset, which is the adjusted operating income divided by adjusted operating expenses. This study examined financial sustainability in regard to Operational Self-Sufficiency (OSS) ratio.

1.1.3 Deposit-Taking Microfinance Banks in Kenya

The Kenyan Microfinance banks are essential in the national economy by offering financial services to marginalized communities, thereby fostering economic empowerment, poverty reduction and financial inclusion (Memba & Muriithi, 2023). Established under the Microfinance Act of 2006, these institutions serve as formal financial intermediaries targeting on low-income people, small businesses, and rural communities without access to conventional banking services (Central Bank of Kenya, 2023). The CBK controls deposit-taking microfinance institutions (DT-MFIs) to ensure their stability and compliance with financial and operational standards. This oversight includes the licensing process, monitoring of capital adequacy, and enforcement of risk

management practices, which collectively contribute to the development of a secure and sustainable microfinance sector aligned with Kenya's financial inclusion goals.

DT-MFIs exhibit various attributes that distinguish them within the financial sector. These institutions operate on a dual mandate of social impact and financial sustainability, striving to balance profitability with the goal of empowering marginalized populations (Central Bank of Kenya, 2023). They provide tailored financial products like group lending programs, savings accounts, microinsurance and microloans. Additionally, many DT-MFIs focus on capacity-building initiatives, offering financial literacy programs to enhance their clients' ability to manage resources and foster entrepreneurship (Memba & Muriithi, 2023). Unlike traditional banks, DT-MFIs often deploy relationship-based lending models, which leverage personal interactions and local community knowledge to assess creditworthiness and build trust.

Despite their good work, DT-MFIs in Kenya face significant challenges, including high operating costs, credit risks associated with lending to low-income clients, and competition from commercial banks and informal lenders (Memba & Muriithi, 2023). Despite facing critical problems DT-MFIs prove they can change with new business models. DT-MFIs use financial technology solutions to make their operations run better and serve more customers. DT-MFIs now serve customers better than before through mobile banking tools and data platforms that cut approval delays and help monitor lending risks (Central Bank of Kenya, 2023). DT-MFIs use AI and data analytics tools to evaluate credit risk and deliver better-targeted financial products to customers. The blend of fintech with DT-MFIs reduced operating costs allowing them to offer more products to underprivileged communities and build better competitiveness across Kenya's financial sector.

1.2 Statement of the Problem

The adoption of fintech is widely believed to be a catalyst for improving DT microfinance banks financial sustainability (Wanyonyi & Ngaba, 2021). The integration of fintech tools like online lending platforms, card payment systems, digital payment systems and mobile banking boost microfinance banks operations by lowering business expenses while serving more customers (Otieno, 2020). Benami and Carter (2021) found that by streamlining operations while making services easier to access and including more people in the financial system fintech will enhance key financial performance measures. These improvements would help microfinance banks keep solid profit margins while managing cash better to improve business success over time.

Despite potential benefits from financial technology DT microfinance banks in Kenya now show declining financial sustainability indicators, including ROA, ROE, and OSS 9 Wanyonyi & Ngaba, 2010. From 2021 to 2023, the Operational Self-Sufficiency (OSS) ratio of Kenyan DTMFBs exhibited a declining trend, indicating worsening financial sustainability. In 2021, the OSS ratio stood at approximately 115.2%, suggesting that the banks were generating sufficient revenue to settle their operating expenses, including financial expenses and loan losses. However, by 2022, the OSS ratio had declined to 108.7%, reflecting a reduction in the ability of these institutions to sustain themselves financially (Central Bank of Kenya, 2023). The situation worsened further in 2023, with the OSS ratio dropping to 97.3%, falling below the critical 100% threshold. This decline indicates that, by 2023, microfinance banks were no longer generating enough revenue to cover their operating costs, leading to financial distress. This trend highlights the need to investigate whether financial technologies adoption has had a positive or negative effect on the financial sustainability of these institutions. While fintech solutions are expected to

enhance efficiency and expand financial inclusion, the declining OSS ratio raises concerns about their effectiveness in ensuring long-term financial sustainability.

Different researches have been performed on financial technologies and financial sustainability in Kenya. For instance, Mokaya (2020) examined how financial technology impacts financial performance of Kenyan tier II banks; Maina (2024) looked at the relationship between financial technology and financial inclusion in the Kenyan banking industry; and Otieno (2020) explored the Kenyan commercial banks' financial performance in relation to their adoption of digital banking technologies. However, these studies were primarily focused on commercial banks, which differ from microfinance banks in terms of structure, regulatory framework, target clientele, and operational models. Despite the increasing adoption of financial technologies, deposit-taking microfinance banks (DTMFs) in Kenya continue to experience declining financial sustainability, as reflected in key indicators such as ROA, ROE, and OSS. Existing literature does not adequately address the direct impact of financial technologies on the financial sustainability of DTMFBs. This research sought to bridge this gap by specifically investigating how four key financial technologies, internet banking, card payment systems, online lending platforms, and mobile banking, affect the financial sustainability of deposit-taking microfinance banks in Kenya.

1.3 Research Objectives

1.3.1 General Objective

The general objective of the study was to examine the effect of financial technologies on financial sustainability of deposit taking microfinance banks in Kenya

1.3.2 Specific Objectives

The specific objectives of the study were;

- i. To examine the effect of mobile banking on financial sustainability of deposit taking microfinance banks in Kenya
- ii. To determine the effect of online lending platforms on financial sustainability of deposit taking microfinance banks in Kenya
- iii. To establish the effect of card payment systems on financial sustainability of deposit taking microfinance banks in Kenya
- iv. To assess the effect of internet banking on financial sustainability of deposit taking microfinance banks in Kenya

1.4 Research Questions

- i. What is the effect of mobile banking on financial sustainability of deposit taking microfinance banks in Kenya?
- ii. How do online lending platforms affect the financial sustainability of deposit taking microfinance banks in Kenya?
- iii. What is the effect of card payment systems on financial sustainability of deposit taking microfinance banks in Kenya?
- iv. How does internet banking affect financial sustainability of deposit taking microfinance banks in Kenya?

1.5 Significance of the Study

This investigation is of great benefit to microfinance banks' management in Kenya, policymakers and other academicians as well as researchers.

1.5.1 Kenyan microfinance banks' management

This research offers valuable information to the management of Kenyan microfinance banks by examining how financial technologies impact financial sustainability. Understanding the effects of technologies such as card payment systems, online lending platforms, mobile banking and internet banking may enable decision-makers to adopt strategies that improve customer reach, reduce costs and improve operational efficiency. The findings may also help management optimize resource allocation, mitigate financial risks, and align technological investments with long-term sustainability goals. By leveraging these insights, microfinance banks can enhance their financial stability while remaining competitive in an evolving digital landscape.

1.5.2 Government of Kenya and policymakers

To the Kenyan government and policymakers, the research offers essential information to support the development of informed regulations and policies that foster a robust microfinance sector. Understanding how different financial technologies, like mobile banking, online lending platforms, internet banking and card payment systems affect the financial sustainability of microfinance banks may enable policymakers to create a regulatory framework that promotes sustainable growth and financial health in this sector. In addition, the findings could help policymakers design guidelines to promote adoption of financial technologies for microfinance institutions, improving their resilience against economic downturns and enhancing their capacity to deliver affordable credit and financial services.

1.5.2 Other Researchers and Academicians

The research advances understanding of how financial technologies impact financial sustainability of Kenyan deposit taking microfinance banks. To other academicians and

researchers, the research offers valuable insights that can be utilized as reference materials and in identifying existing research gaps within the field of microfinance and financial sustainability. In addition, the study creates a ground upon which more investigation can be carried out, enabling future studies to delve deeper into aspects such as financial technologies' effect on financial sustainability. Researchers may also use this study to compare findings across different financial institutions or regions, contributing to a greater comprehension of optimal financial technologies in the microfinance sector globally.

1.6 Scope of the Study

The research aims to examine the effect of financial technologies on financial sustainability of Kenyan deposit taking microfinance banks. The focus of the research was four financial technologies, which involve internet banking, card payment systems, online lending platforms and mobile banking. In addition, the study looked at the microfinance banks' financial sustainability in terms of Operational Self-Sufficiency ratio. The study was conducted among all the Kenyan microfinance banks. According to the CBK (2023), there are 14 Kenyan microfinance banks. The study made use of secondary data, which was retrieved from Bank supervision reports by the CBK and the annual financial statements of individual Kenyan microfinance banks. The research covered the time frame from 2019 to 2023. The five-year timeframe is chosen to capture recent trends in financial technology adoption and financial sustainability, allowing for an assessment of the impact over a reasonable period while considering regulatory changes and economic fluctuations. This period also ensures the inclusion of pre- and post-COVID-19 financial performance, which may influence technology adoption and financial sustainability.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter provides a comprehensive review of relevant literature to provide the theoretical and empirical foundation for the study. It initiates with a theoretical review, which examines key theories supporting the research, followed by an empirical review that evaluates existing studies related to the study objectives. Further, the chapter develops a conceptual framework to illustrate the relationships between variables and concludes with the study variables' operationalization.

2.2 Theoretical Review

Theoretical review examines different ways scholars explain phenomena under investigation. It explores the key theories that underpin the study, showing how study variables connect with each other (Babbie, 2021). It examines established frameworks relevant to the research, offering insights into their application and relevance. The study used diffusion of innovation theory alongside unified theory of acceptance, resource-based view and use of technology.

2.2.1 Unified Theory of Acceptance and Use of Technology

The theory was proposed by Morris, Venkatesh and Davis (2003). The theory consolidates eight prominent theories and models, like TAM and TPB, to describe the features that impact individuals' decisions to accept and utilize new technologies (Bajunaied, 2023). It synthesizes elements from several existing models, like the Technology Acceptance Model and Theory of Planned Behavior to create a unified framework for comprehending the adoption of technology. UTAUT identifies four main factors that influence technology usage: social influence (how other people's opinions impact the decision to adopt), performance expectancy (the technology

perceived benefits), effort expectancy (the ease of utilization), and facilitating conditions (the infrastructure and resources available to support usage) (Strzelecki, 2023). These factors, along with individual moderators like experience, gender and age collectively determine whether a technology is adopted.

Technology adoption makes sense when analyzing specific framework assumptions using the UTAUT model. People adopt technology when they see how useful and simple to use it is according to Tamilmani and Dwivedi (2021). Without proper support and technologie-enabled facilities, the model shows new technology adoption depends mainly on user assessments of utility and user-friendliness (Strzelecki, 2023). It considers both singular traits like user experience alongside core determinants to show exactly how technology adoption varies across distinct groups (Bajunaied, 2023).

The study used of UTAUT to explain how financial technologies (FinTech) affect financial sustainability of deposit-taking Kenyan microfinance banks. The UTAUT framework will be applied to explain how internet banking, card payment systems, online lending platforms and mobile banking influence financial outcomes. Mobile banking and online lending platforms improve the convenience and accessibility of financial services, which can improve customer engagement and loan repayment rates, thus supporting sustainability (Ayaz & Yanartaş, 2020). In addition, card payment systems and internet banking improve transactional efficiency, reducing operational costs and increasing the reach of financial services, contributing positively to the sustainability and financial performance of these organizations. Each of these technologies is likely to be adopted more successfully if they are in line with the customers' performance

expectancy (usefulness), ease of use, and are supported by adequate infrastructure and social influence, thus enhancing the financial sustainability of DTMBs.

One of the main weaknesses of the UTAUT is its limited ability to account for external environmental factors, such as regulatory policies, economic conditions, and industry-specific challenges, which are crucial in the financial sector (Strzelecki, 2023). The model primarily focuses on individual user adoption behaviors, neglecting institutional and organizational constraints that might affect technology implementation in highly regulated environments like microfinance banks. Additionally, UTAUT makes the assumption that decision-making is linear and logical, which may not adequately represent the complexities of financial technology adoption, where risk perceptions, compliance requirements, and security concerns play a significant role (Tamilmani & Dwivedi, 2021). This study addresses these weaknesses by integrating regulatory and financial sustainability factors into the framework, ensuring a more comprehensive analysis of how financial technologies impact the performance of deposit-taking microfinance banks within Kenya's strict regulatory environment.

2.2.2 Diffusion of Innovation Theory

The Theory was created in 1962 by Rogers. The theory defines exactly how and why new technology and concepts move across cultural borders (Benhabib & Tonetti, 2021). It suggests that adoption of innovations follows a predictable pattern among individuals in a social system, dividing adopters into 5 categories: customers show up as innovators early majority early adopters laggards and late majority (Vargo, Akaka & Wieland, 2020). Rogers explained that adoption happens when people perceive advantages in the new technology plus find it easy to try and easy to see results (Pinho, Franco & Mendes, 2021).

The assumptions underlying the Theory include the belief that innovations spread over time through a social system, starting with a few individuals (innovators) and gradually reaching the majority (Lee, 2021). The theory assumes that individuals adopt new technologies based on factors like perceived relative advantage (degree at which the innovation is superior to earlier solutions), compatibility with current procedures, ease of use (low complexity), and trialability. The model shows that communication links help people decide which new technologies to use through relationships with their social networks. This model shows how people follow group opinions and take up technology at defined stages (Benhabib & Tonetti, 2021).

In deposit-taking Kenyan microfinance banks, the Diffusion of Innovation Theory explains how various financial technologies, like internet banking, mobile banking, card payment systems, and online lending platforms influence their financial sustainability. Online lending platforms and mobile banking may initially be adopted by innovators and early adopters who recognize their potential to enhance financial access, streamline lending processes, and increase customer engagement. When early majority adopters use successful technologies their effectiveness grows and companies become more operationally efficient (Benhabib & Tonetti, 2021). Online payments and online banking bring upfront efficiency to customer banking while saving costs and making it simpler for people to access their funds which benefits sustainability. Banks will adopt new technologies at different rates based on their system compatibility, technology benefits, and integration capacity which drive the diffusion process.

One of the key weaknesses of the DOI Theory is that it assumes a uniform adoption process, overlooking the institutional, regulatory, and financial constraints that may influence technology adoption in different organizations. The theory primarily focuses on individual and

social influences but does not sufficiently account for structural barriers, such as regulatory compliance, high initial investment costs, and technological infrastructure limitations, which can hinder financial technology adoption in microfinance banks (Benhabib & Tonetti, 2021). Additionally, DOI assumes that all innovations are beneficial, failing to consider that some technologies may not align with an institution's strategic objectives or operational needs (Lee, 2021). This study addresses these weaknesses by incorporating regulatory and financial sustainability factors into the analysis, ensuring a more context-specific understanding of how financial technologies impact microfinance banks within Kenya's regulated environment.

2.2.3 Resource-Based View

The Resource-Based View was proposed in 1984 by Wernerfelt and later expanded by scholars such as Barney in 1991. RBV theory proposes that organizations attain a sustainable competitive advantage through the ownership and utilization of resources that are rare, valuable, unique and non-replaceable (Gerhart & Feng, 2021). The resources can be both physical, like financial capital and technology, and intangible, like organizational culture, expertise, and reputation. Under RBV principles firms build their competitive advantage through unique internal possessions which brings superior business results (Khanra, Kaur & Dhir, 2022).

The assumptions underlying the resource-based view include the notion that firms are heterogeneous, possessing unique resources and capabilities that distinguish them from other firms. The theory assumes that in order for these resources to contribute to long-term competitive advantage, they must be non-replaceable, unique, precious and rare (Barney, Ketchen & Wright, 2021). In addition, RBV assumes that firms have the capacity to exploit these resources effectively through strategic management, which involves developing and leveraging resources

that provide a unique advantage. Furthermore, the RBV emphasizes that a firm's internal resources, rather than external market factors, are pivotal to its long-term success and sustainability (Gerhart & Feng, 2021).

Resource-Based View was used to explain how internet banking, card payment systems, online lending platforms and mobile banking contribute to financial sustainability in deposit-taking Kenyan microfinance banks. The theory reveals that firms can keep long-term benefits by effectively using their special internal assets (Khanra et al., 2022). Microfinance banks should treat financial technology adoption as a core resource that helps them work better while serving customers and survive long-term. Through digital channels like online lending platforms and mobile banking microfinance banks expand their customer reach to serve many more people. Transactions through card payment systems and online banking lower operating costs while making processes work faster.

A key weakness of the RBV Theory is its limited emphasis on external factors, like market dynamics, regulatory constraints and competition, which can substantially influence an company's capacity to leverage its resources effectively (Gerhart & Feng, 2021). RBV assumes that firms have complete control over their resources and that competitive advantage is primarily derived from internal capabilities, neglecting the role of external forces like economic fluctuations, technological disruptions, and policy changes. Additionally, the theory does not fully address how firms acquire or develop strategic resources over time, making it less applicable in rapidly evolving sectors like financial technology (Gerhart & Feng, 2021). This study addresses these weaknesses by integrating external factors such as Kenya's regulatory

environment and competitive pressures into the analysis, ensuring a more comprehensive evaluation of how financial technologies impact the financial sustainability of DTMBs.

2.3 Empirical Review

This section examines empirical investigations on the impact of different financial technologies on the financial sustainability of microfinance banks. It explores how mobile banking, online lending platforms, card payment systems, and internet banking influence financial sustainability.

2.3.1 Mobile Banking and Financial Sustainability

Morshed, Ali, and Bari (2021) examined how mobile banking impacts Islamic Microfinance Institution performance in Bangladesh. Using a questionnaire survey method, the research indicated that mobile banking significantly and positively impacts the performance of IMFIs, primarily through improved efficiency, enhanced staff productivity, and better communication. The study further noted that mobile banking facilitated faster transaction processing, reducing delays and improving client satisfaction. Additionally, mobile platforms enabled broader outreach to remote and underserved populations, thereby expanding the client base and increasing financial inclusion. Since this research targeted Islamic Microfinance Institutions in Bangladesh it cannot provide accurate results for Kenyan microfinance institutions because their operating environments differ significantly. In addition, the investigation's dependent variable was the Microfinance Institutions' performance, whereas the current study focuses on financial sustainability.

Abimbola, Adegoke, and David (2024) investigated the effect of mobile banking on the performance of microfinance banks in Nigeria. The research employed a descriptive model to examine the yearly reports from microfinance banks between 2007 and 2021. The findings

revealed that mobile banking had positively, though insignificant, effect on the performance of Nigerian microfinance banks. The study further noted that the insignificant impact may be attributed to slow adoption of mobile banking technology, especially among customers in rural and semi-urban areas. In addition, the researchers recommended that microfinance institutions invest in customer education programs and strengthen cyber security measures to boost customer confidence and encourage widespread adoption of mobile banking platforms. However, the research was undertaken in Nigeria, a country with a different microeconomic environment and legal frameworks compared to Kenya, making the findings less generalizable to the Kenyan context.

Uwamariya, Loebbecke, and Cremer (2020) investigated how mobile banking impacts the performance of Rwandese microfinance banks. The research employed a descriptive methodology, with data gathered through semi-structured questionnaires. The research showed that mobile banking helps MFIs cut loan defaults and transfer expenses which improve their operational performance. The study also found that mobile banking enhances client outreach by allowing MFIs to serve customers in remote areas more efficiently. Furthermore, the increased accessibility of mobile platforms was linked to improved loan repayment behavior, as clients found it easier to make timely payments. The study recommended that microfinance institutions continue investing in mobile infrastructure and user-friendly platforms to sustain performance gains and expand financial inclusion. However, the research only covered MFIs in Rwanda, a country with unique societal, economic, cultural, and business rules compared to Kenya, making the findings less applicable. Additionally, the research adopted a descriptive methodology, whereas this study employs an explanatory research design.

Mosoti, Wafula and Nyangâ (2022) performed an investigation to evaluate the effect of mobile banking technology on the financial performance of Kenyan deposit-taking MFIs. The research employed a descriptive methodology, targeting a population of 387 employees from all deposit-taking MFIs operating between 2016 and 2020. The study established a positive link between the financial performance and mobile banking of these institutions. Additionally, the study reported that mobile banking contributed to enhanced customer satisfaction and loyalty due to increased accessibility and convenience. It also highlighted that mobile platforms significantly reduced transaction turnaround times, thereby improving overall service efficiency. Furthermore, the researchers noted that mobile banking allowed MFIs to minimize operational costs and expand outreach, which in turn strengthened their competitive position in the financial services sector. While their study used a descriptive methodology, this study employed an explanatory study approach. Additionally, the study focused on financial performance as the dependent variable whereas the present study's dependent variable was financial sustainability.

Ndirangu, Kiragu, and Ngunyi (2020) investigated the impact of mobile banking on the performance of Kenyan microfinance banks. The research employed a census survey design, focusing on 13 MFIs controlled by CBK. Their findings indicated that mobile banking substantially influenced the performance of these banks. The study highlighted that the adoption of mobile banking enabled microfinance institutions (MFIs) to reach a broader customer base, particularly in rural areas where traditional banking infrastructure is limited. The study also found that mobile banking services improved the operational efficiency of the MFIs, reducing transaction costs and increasing the speed of financial services, which positively impacted profitability. Furthermore, the researchers emphasized that mobile banking contributed to enhanced customer satisfaction and loyalty, as it offered more accessible, convenient, and secure

financial services compared to traditional banking methods. However, unlike the current study, which adopts an explanatory study approach, the study utilized a census survey design. Also, the study uses performance as the response variable while this uses financial sustainability.

Ondago (2024) performed a study to assess the connection between mobile banking and the financial performance of Kenyan microfinance banks. The research adopted a mixed research design, targeting all 14 operational MFIs. Primary data was obtained using structured questionnaires. The research established that mobile banking has a significant positive effect on the financial performance of microfinance banks (MFBs). The study revealed that mobile banking facilitates faster loan processing and repayments, contributing to improved cash flow management within these institutions. Moreover, the study concluded that the integration of mobile banking platforms has helped microfinance banks reduce operational costs, thus enabling them to allocate more resources toward expanding their service offerings and improving profitability. However, the research used financial performance as the predictor variable while this research uses financial sustainability as the response variable. Further, the research used a mixed approach whereas the present study utilized an explanatory research methodology.

2.3.2 Online Lending Platforms and Financial Sustainability

Chuc, Atayah and Ozer (2023) conducted a research to explore the impact of online lending platforms on the financial performance of microfinance institutions in Bahrain. The research employed an explanatory research design and found that online lending platforms positively influenced MFIs' financial performance. Additionally, the study highlighted that the introduction of online lending platforms in Bahrain's MFIs substantially improved operational efficiency by decreasing costs and accelerating the processing of loan. The researchers also noted that online platforms provided MFIs with access to a larger pool of potential borrowers, enhancing their

ability to extend credit to more customers. Furthermore, the study found that the use of online lending platforms increased transparency in the lending process, thereby boosting customer trust and reducing the risk of default. The study concluded that the integration of online lending platforms significantly contributed to the sustainability and growth of microfinance institutions in Bahrain. However, the study was limited to Bahrain, so its findings cannot be generalized to the Kenyan context, where microfinance banks encounter distinct challenges and opportunities in implementing online lending platforms.

Umutoni and Osiemo (2023) assessed the effect of online lending platforms on the financial performance of Rwandese commercial banks. The research employed a descriptive methodology, targeting a population of 370 employees at Equity Bank Plc. The findings revealed that online lending platforms had no statistically substantial effect on the financial performance of Rwandese Equity Bank Plc. The study further suggested that the lack of significant impact might be due to the limited adoption of online lending platforms by the bank's customers, particularly in rural areas where internet penetration was lower. Additionally, the researchers noted that while online platforms did streamline loan application processes, challenges such as customer trust and technological barriers hindered their full potential. Despite these challenges, the study recommended that Equity Bank Plc continue to explore innovative ways to integrate online lending services, as they may yield positive results in the long term with more widespread adoption and enhanced customer education. Nonetheless, the research focused on Rwandese commercial banks, specifically Equity Bank Plc, and therefore, the outcome is inapplicable to the financial sustainability of Kenyan microfinance banks due to differences in socio-economic, regulatory, and technological environments between the two countries. Further, the research

utilized a descriptive research approach whereas the current study utilized an explanatory research design.

Anyango (2021) explored on the impact of online lending platforms on the financial performance of Kenyan microfinance banks. The research employed a causal research methodology, targeting a sample of 14 microfinance banks controlled by CBK. The findings indicated a positive and substantial correlation between the use of online lending platforms and the improved financial performance of these microfinance banks. This research highlighted the digital platforms role in enhancing profitability and operational efficiency. The study emphasized that online lending platforms allowed microfinance banks to expand their customer base by offering faster and more convenient loan processing. The study also revealed that the integration of these platforms led to reduced operational costs by automating key aspects of the lending process, thus improving the overall cost-to-income ratio of the banks. Additionally, the research suggested that online lending platforms contributed to a more inclusive financial ecosystem by making credit more accessible to individuals in underserved regions, promoting financial inclusion. However, while the research utilized a causal research approach to establish direct relationships, the present research utilized an explanatory research design.

Kiarie and Munene (2024) explored on the impact of online lending platforms on the financial performance of Kenyan commercial banks. The research utilized a descriptive survey methodology, analyzing data from 5 banks that had been actively providing online-credit services for over 10 years. The data was sourced from CBK and publicly available financial records. The research established that online lending platforms had no effect on the commercial banks' financial performance. The study pointed out that while these banks had successfully integrated online lending services, the limited growth in loan uptake through these platforms

contributed to the lack of significant impact on financial performance. Additionally, the study observed that factors such as high default rates, regulatory constraints, and customer reluctance to adopt digital lending services slowed the expected financial benefits. They concluded that for online lending platforms to positively influence financial performance, commercial banks would need to invest more in customer education and regulatory compliance to boost platform adoption and reduce risks associated with digital lending. However, the research used a descriptive survey research design whereas the current study adopted an explanatory research design.

2.3.3 Card Payment Systems and Financial Sustainability

Bousrih (2023) examined the influence of card payment systems on the banking sector, drawing evidence from countries at the forefront of Fintech innovation. The research employed panel data analysis, utilizing information from the Bank for International Settlements (BIS) databases and the World Development Indicators. The results showed a substantial positive connection between card payment systems and bank performance. The study highlighted that the widespread adoption of card payment systems facilitated increased transaction volumes, contributing to higher revenues for banks. Furthermore, the study found that card payment systems improved customer experience by offering more convenient, secure, and efficient payment options, which in turn led to greater customer retention and loyalty. Additionally, the research suggested that banks with a high adoption of card payment systems were better equipped to capitalize on new business opportunities, such as expanding into digital financial services, thereby enhancing their long-term competitiveness in the market. However, while the study emphasized bank performance, the current research prioritizes the financial sustainability of MFIs. Additionally, the research focused on Fintech-leading countries developed nations characterized by advanced

digital infrastructures and cutting edge digital banking technologies making its findings less applicable to Kenyan microfinance banks.

Yusuf, Oke and Ezike (2019) conducted an investigation to evaluate the impact of card payment systems on the performance of Nigerian deposit money banks. Ordinary least squares (OLS) estimation method was adopted in the study. The findings established that card payment systems have a positive and substantial impact on the performance of Nigerian deposit money institutions. The study revealed that the introduction of card payment systems led to a significant increase in transaction volumes, contributing to higher revenue streams for the banks. Additionally, the research highlighted that the use of card payment systems enhanced operational efficiency by automating payment processes, reducing human error, and lowering transaction costs. Moreover, the study concluded that the widespread adoption of card payment systems improved customer satisfaction by providing a more convenient and secure way of making payments, ultimately leading to greater market share and profitability for the banks. However, the research was limited to Nigerian banks which differ significantly with Kenyan microfinance banks, thus making the findings less applicable to Kenyan context. In addition, the research utilized ordinary least squares (OLS) estimation technique whereas the current study adopted an explanatory research design.

Musa and David (2020) examined the card payment systems impact on the financial performance of microfinance banks in Niger State. The study employed a cross-sectional survey design and found that card payment systems had a substantial positive effect on the COE-Minna Microfinance Bank's financial performance. The research indicated that the implementation of card payment systems helped streamline transactions, leading to faster service delivery and an increase in customer satisfaction. Furthermore, the study revealed that the adoption of these

systems enabled the bank to attract a wider customer base, including individuals who preferred digital payment methods over traditional cash-based transactions. The study concluded that the integration of card payment systems not only enhanced the operational efficiency of COE-Minna Microfinance Bank but also contributed to its long-term financial sustainability by driving both revenue growth and cost reduction. However, the study was conducted in Nigeria, which differs significantly from Kenya in terms of regulatory frameworks, economic environments, and levels of technological adoption in the financial sector hence making the findings less applicable to Kenyan context. Furthermore, the study adopted a cross-sectional survey research design, whereas present research adopted an explanatory research design.

Wangui and Nzuki (2021) carried out a research to explore the effect of card payment systems on the financial performance of Kenyan financial institutions. The research utilized a descriptive methodology, targeting employees of Sumac Deposit Taking MFI. Data was gathered using both secondary sources and questionnaires. The findings revealed that card payment systems had a positive and substantial connection with the financial performance of microfinance institutions in Kenya. Additionally, the study highlighted various benefits of card payment systems, including enhanced speed, increased profitability, and improved convenience. The research further showed that the implementation of card payment systems allowed microfinance institutions to streamline their operations, reducing operational costs and increasing efficiency in processing transactions. Moreover, the study found that the adoption of these systems contributed to higher customer retention rates by providing customers with a secure and efficient method to access their funds and make payments. The study concluded that card payment systems played a pivotal role in driving growth and ensuring the sustainability of microfinance

institutions in Kenya. However, the research utilized a descriptive research design whereas the current study employed an explanatory research design.

Chelangat, Kiprop and Mutai (2022) conducted a research to examine the relationship between card payment systems and the financial performance of Kenyan commercial banks. The research utilized a cross-sectional descriptive survey methodology, targeting 42 commercial banks controlled by CBK from 2011 to 2020. The study found that card payment systems had a significant positive correlation with the commercial bank's financial performance. The research further revealed that the integration of card payment systems enabled commercial banks to reduce transaction processing times, improve customer satisfaction, and boost the volume of transactions. Additionally, the study highlighted that card payment systems contributed to increased revenue generation, as they offered banks the opportunity to diversify their service offerings and target a broader customer base. The study concluded that the effective use of card payment systems is a key factor in enhancing the financial performance and competitiveness of commercial banks in Kenya. However, the research utilized a cross-sectional descriptive survey methodology whereas the current study employed an explanatory research approach.

2.3.4 Internet Banking and Financial Sustainability

Torki, Rezaei, and Razmi (2020) undertook a study to examine the impact of the internet banking on the performance of microfinance banks in chosen Islamic countries, such as Indonesia, Morocco, Egypt, Saudi Arabia, Senegal, Turkey, the United Arab Emirates, Oman, Jordan, Kuwait, Malaysia, and Iran. The investigation employed a descriptive research methodology and utilized annual panel data from 2011 to 2017. The results showed that internet banking had a positive and substantial effect on the performance of microfinance banks. The study further indicated that internet banking improved the efficiency and accessibility of banking

services, enabling microfinance banks to reach underserved populations in both rural and urban areas. Additionally, the research found that the adoption of internet banking led to increased customer satisfaction and loyalty, as clients were able to access services conveniently and securely. The study concluded that the widespread implementation of internet banking platforms not only enhanced operational performance but also contributed to the overall growth and sustainability of microfinance banks in the studied countries. However, the study was conducted in Islamic countries, which differ from Kenya in terms of regulatory, economic, and socio-cultural environments, making the findings less applicable to the Kenyan context.

Chukwu and Molokwu (2022) analyzed the impact of internet banking on the performance of Nigerian commercial banks between 2010 and 2019. Data for the study were obtained from the CBN statistical bulletins and the annual reports of NDIC. The study established that internet banking had a positive but unsubstantial effect on the performance of Nigerian commercial banks. The research further suggested that while internet banking contributed to operational efficiency and improved customer service, its impact was not as significant as expected, possibly due to low adoption rates among certain customer segments. Additionally, the study noted that factors such as internet infrastructure challenges, cybersecurity concerns, and regulatory constraints hindered the full potential of internet banking in Nigeria. The study concluded that for internet banking to have a more substantial impact, Nigerian commercial banks would need to invest in improving technological infrastructure, enhancing cybersecurity measures, and increasing customer awareness. However, the research was confined to Nigerian commercial banks, making its findings inapplicable to Kenyan microfinance institutions, which operate in distinct environments and under conditions that differ significantly from those of

commercial banks. Additionally, while the previous study focused on financial performance, the current study emphasized financial sustainability.

Kinyanjui and Ngatia (2023) undertook a study to evaluate the research of internet banking on the financial performance of deposit-taking Kenyan microfinance institutions. The study employed a descriptive research design, targeting 14 microfinance institutions. The study established that internet banking had no substantial effect on the financial performance of Kenyan deposit-taking microfinance banks. The researchers suggested that while internet banking had the potential to enhance service delivery and operational efficiency, its impact on profitability and growth was limited due to factors such as low customer adoption and limited internet infrastructure in rural areas. Additionally, the study found that many microfinance institutions faced challenges in integrating advanced digital banking services due to regulatory hurdles and financial constraints. The study concluded that for internet banking to positively influence the financial performance of Kenyan microfinance banks, further investments in technology, customer education, and regulatory adjustments would be necessary. Nonetheless, the study used a descriptive research design whereas the current study adopts an explanatory research design.

Maseko and Kalama (2022) examined the impact of internet banking on the financial performance of Tanzanian commercial banks using a case study design. Data was gathered through questionnaires. The findings established that internet banking positively and substantially influenced the financial performance of Tanzanian commercial banks, highlighting its role in improving operational efficiency and profitability within the industry. The study also noted that the adoption of internet banking services led to a reduction in operational costs by automating various banking processes, thereby enhancing overall productivity. Furthermore, the

study emphasized that the integration of internet banking improved customer satisfaction by offering convenient, 24/7 access to banking services, which helped banks attract a larger customer base and retain existing clients. Nonetheless, the research was confined to Tanzanian commercial banks thus the results cannot be applied to microfinance banks in Kenya due to differences in regulatory and legal frameworks between the countries. In addition, the study dependent variable was financial performance which differs significantly from microfinance banks in Kenya.

Ndirangu, Kiragu and Ngunyi (2020) undertook a research to examine the impact of internet banking on the performance of Kenyan microfinance banks. The research utilized a descriptive research design, targeting the 13 microfinance banks controlled by the CBK. Primary data was obtained through self-administered questionnaires. The findings indicated that internet banking positively impacts the performance of microfinance banks. The study revealed that internet banking helped microfinance banks improve operational efficiency by automating loan application processes and transaction handling, leading to a reduction in service delivery time and costs. Furthermore, the research showed that internet banking provided microfinance banks with the ability to expand their customer base, particularly among tech-savvy and urban clients, by offering more convenient and accessible financial services. The study concluded that the adoption of internet banking played a key role in enhancing the financial sustainability and competitiveness of microfinance banks in Kenya. However, the research utilized a descriptive research design, whereas the current research employed an explanatory research design. Furthermore, the study employed bank performance as the dependent variable, whereas the present research focused on financial sustainability.

2.4 Research Gaps

A review of existing literature reveals several notable research gaps related to the influence of digital financial technologies on the financial sustainability of microfinance banks. Most prior studies, such as those by Morshed et al. (2021) and Uwamariya et al. (2020), focused on countries like Bangladesh and Rwanda, whose socio-economic and regulatory contexts differ significantly from Kenya, limiting the generalizability of their findings. Additionally, many studies such as those by Chuc et al. (2023), Yusuf et al. (2019), and Musa and David (2020) used financial performance or general institutional performance as the dependent variable rather than financial sustainability, which this study seeks to address more directly. Methodologically, several studies employed descriptive, case study, or survey approaches, with few adopting explanatory research designs suitable for establishing causal relationships. Furthermore, limited research has comprehensively examined all four digital financial services mobile banking, online lending platforms, card payment systems, and internet banking within the context of deposit-taking microfinance banks in Kenya. This study, therefore, fills a critical gap by focusing on financial sustainability and employing a context-specific, explanatory approach tailored to the Kenyan microfinance sector. Table 2.1 summarizes the literature based on the study's objectives, highlighting key aspects of previous studies, their methodologies, main findings, and identified gaps.

TABLE 2. 1
Research Gaps

Authors	Study	Methodology	Main Findings	Gaps
Morshed, Ali, and Bari (2021)	How mobile banking impacts Islamic Microfinance Institution performance in Bangladesh.	The study employed a questionnaire survey method.	The research established that mobile banking significantly and positively impacts the performance of MFIs, primarily through improved efficiency, enhanced staff productivity, and better communication.	The study was conducted in Bangladesh. The study used a questionnaire survey method. The study used performance as the dependent variable.
Uwamariya, Loebbecke, and Cremer (2020)	How mobile banking impacts the performance of Rwandese microfinance banks.	The research employed a descriptive methodology.	The research showed that mobile banking helps MFIs cut loan defaults and transfer expenses which improves their operational performance.	The research only covered MFIs in Rwanda, a country with unique societal, economic, cultural, and business rules compared to Kenya. The research adopted a descriptive methodology.
Chuc, Atayah and Ozer (2023)	Impact of online lending platforms on the financial performance of	The research employed an explanatory research design.	The study found that online lending platforms positively influenced the financial	The study was limited to Bahrain, so its findings cannot be generalized to the Kenyan

	microfinance institutions in Bahrain.		performance of microfinance institutions.	context. The study focused on financial performance.
Kiarie and Munene (2024)	Impact of online lending platforms on the financial performance of Kenyan commercial banks.	The research utilized a descriptive survey methodology.	The research established that online lending platforms had no effect on the commercial banks' financial performance.	The study focused on Kenyan commercial banks which differ from deposit taking microfinance banks. The study used a descriptive survey research design. The study focused on financial performance.
Yusuf, Oke and Ezike (2019)	Impact of card payment systems on the performance of Nigerian deposit money banks.	The study adopted Ordinary least squares (OLS) estimation method.	The findings established that card payment systems have a positive and substantial impact on the performance of Nigerian deposit money institutions.	The study was limited to Nigerian deposit money banks. The study adopted Ordinary least squares (OLS) estimation method, which differ from an explanatory research design. The study's dependent variable was

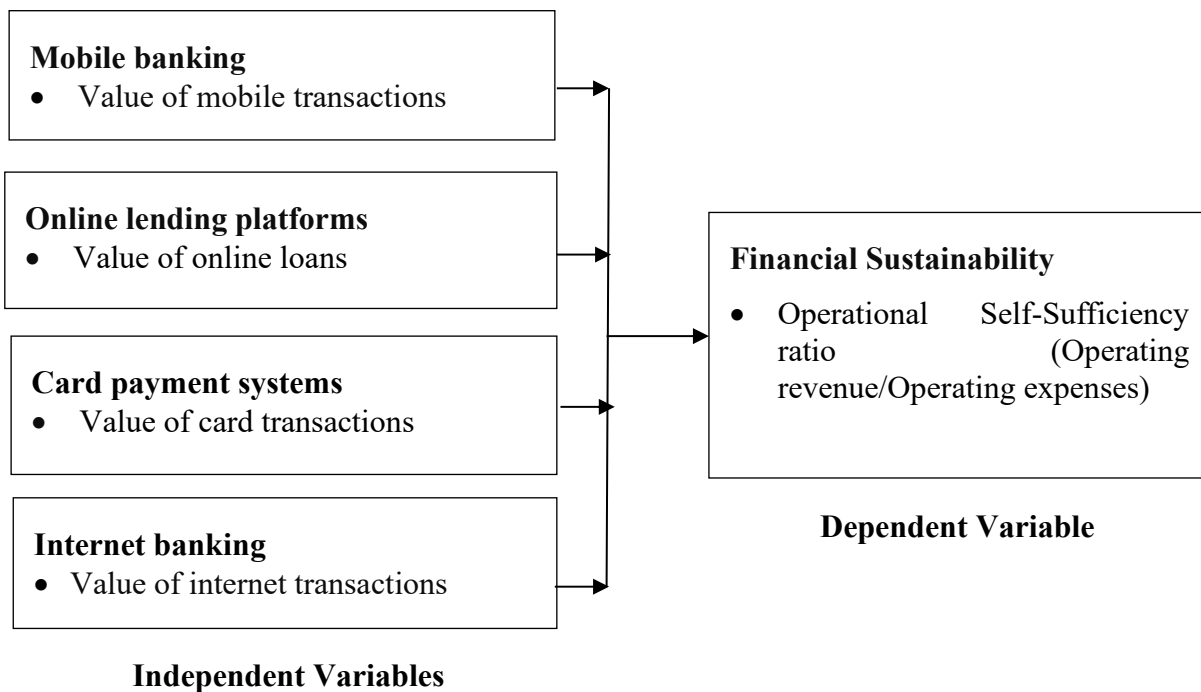
				performance.
Musa and David (2020)	The card payment systems impact on the financial performance of microfinance banks in Niger State.	The study employed a cross-sectional survey design.	The study found that card payment systems had a substantial positive effect on the COE-Minna Microfinance Bank's financial performance.	The study was conducted in Nigeria, which differs significantly from Kenya in terms of regulatory frameworks, economic environments. The study adopted a cross-sectional survey research design. The study mainly focused on financial performance.
Torki, Rezaei, and Razmi (2020)	The impact of the internet banking on the performance of microfinance banks in chosen Islamic countries	The study employed a descriptive research methodology.	The study found that internet banking had a positive and substantial effect on the performance of microfinance banks.	The study was conducted in Islamic countries, which differ from Kenya in terms of regulatory, economic, and socio-cultural environments. The study used a descriptive research methodology The study used performance of

				microfinance banks as the dependent variable.
Maseko and Kalama (2022)	Impact of internet banking on the financial performance of Tanzanian commercial banks	The study used a case study design.	The findings established that internet banking positively and substantially influenced the financial performance of Tanzanian commercial banks, highlighting its role in improving operational efficiency and profitability within the industry.	The study was confined to Tanzanian commercial banks. The study employed a case study research design. The study dependents variable was financial performance.

2.5 Conceptual Framework

A conceptual framework is an organized method that lists the key variables, concepts, and their relationships in a study, providing a clear visual or descriptive representation of how the research is designed (Creswell & Creswell, 2022). Figure 2.1 presents the hypothesized connection between the independent variables and the dependent variable. The independent variables in this study encompass mobile banking, online lending platforms, card payment systems and internet banking. The dependent variable was financial sustainability.

FIGURE 2.1
Conceptual Framework



Financial technologies, such as mobile banking, online lending platforms, card payment systems, and internet banking, represent various dimensions of digital financial services that have the potential to influence the financial sustainability of institutions or individuals. Mobile banking

enhances accessibility and convenience, enabling users to conduct transactions anytime and anywhere. Online lending platforms offer alternative sources of credit, often with quicker processing times and fewer bureaucratic hurdles. Card payment systems streamline transactions and reduce the reliance on cash, improving efficiency and traceability. Internet banking provides comprehensive financial management tools and services through digital channels. Collectively, these innovations in financial technology are expected to impact the dependent variable, financial sustainability, by improving operational efficiency, expanding access to financial services, and fostering better financial decision-making and resource management.

2.6 Operationalization of Study Variables

The process of operationalizing the study variables involves outlining the objectives, categorizing the variables, identifying indicators, selecting measurement methods, and determining the data analysis techniques, all of which are presented in Table 2.2.

TABLE 2. 2

Operationalization of Variables

Objective	Variable Type	Indicators	Measures	Type of data analysis
To examine the effect of mobile banking on financial sustainability of deposit taking Kenyan microfinance banks	Independent • Mobile banking	• Value of mobile transactions	Amount	• Descriptive statistics • Correlation analysis • Regression analysis
To determine the effect of online lending platforms on financial sustainability of deposit taking microfinance banks in Kenya	Independent • Online lending platforms	• Value of online loans	Amount	• Descriptive statistics • Correlation analysis • Regression analysis
To establish the effect of card payment systems on financial sustainability of deposit taking microfinance banks in Kenya	Independent • Card payment systems	• Value of card transactions	Amount	• Descriptive statistics • Correlation analysis • Regression analysis
To assess the effect of internet banking on financial sustainability of deposit taking microfinance banks in Kenya	Independent • Internet banking	• Value of internet transactions	Amount	• Descriptive statistics • Correlation analysis • Regression analysis
	Dependent • Financial Sustainability	<i>Operational Self Sufficiency ratio</i> $= \frac{\text{Operating revenue}}{\text{Operating expenses}}$	Ratio	• Descriptive statistics • Correlation analysis • Regression analysis

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

Research methodology involves the systematic, organized set of principles, processes, and procedures that guide the design, conduct, and evaluation of research studies. Specifically, the chapter encompasses target population, sampling frame, research design, data collection instruments, sample size and sampling technique, data collection procedure as well as data analysis and presentation.

3.2 Research Design

An explanatory research design was utilized in this study. This design focuses on exploring and explaining the causal relationships between variables or phenomena. It aims to uncover the underlying reasons, factors, or mechanisms that contribute to specific outcomes or events (Kothari, 2023). Explanatory research allows researchers to go beyond describing observed patterns and helps them uncover the reasons and mechanisms behind those patterns. It provides a deeper understanding of how and why certain phenomena occur (Krishna, 2020). In this study the best research design was an explanatory one which shows how financial technologies affect financial sustainability of deposit taking Kenyan microfinance banks.

3.3 Target Population

Target population entails the particular group of people for whom a particular initiative is intended (Latwal, 2020). The research was undertaken in deposit taking microfinance banks in Kenya. CBK (2023) provides that, there are 14 microfinance banks in Kenya. Therefore, the study targeted all the deposit taking Kenyan microfinance banks.

3.4 Sample Size and Sampling Technique

The research utilized census since the target population consists of all 14 deposit-taking microfinance banks in Kenya, making it feasible to include every unit in the analysis. A census is appropriate when the group is small, ensuring comprehensive data collection and eliminating sampling error (Hall, 2020). By studying all 14 microfinance banks, the research will capture complete insights, improving the accuracy, reliability and generalizability of the findings. In addition, this approach enabled a comprehensive assessment of how financial technologies influence the financial sustainability of deposit-taking microfinance banks in Kenya, ensuring that variations in technology adoption and sustainability outcomes are fully captured.

3.5 Data Collection Instruments

This research made use of secondary panel data. Secondary panel data refers to pre-existing financial and operational data collected over multiple time periods for the same microfinance banks (Babbie, 2021). Secondary data on mobile banking (value of mobile transactions), online lending platforms (value of online loans), card payment systems (value of card transactions), internet banking (value of internet transactions) and financial sustainability (operational self-sufficiency ratio) was obtained from Bank supervision reports by the CBK and the annual financial statements of individual Kenyan microfinance banks. The research covered the time frame from 2019 to 2023.

The secondary data was collected using a data extraction checklist. A data extraction checklist is a systematic tool used in research, particularly in data mining, to guide and standardize the process of collecting data from various sources (Bryman, 2022). It serves as a structured set of guidelines and criteria for extracting relevant information from documents,

studies, or databases (Devi, 2022). The data extraction checklist comprised seven columns corresponding to the study variables, which include year, microfinance banks, value of internet transactions, value of card transactions, value of online loans, operational self-sufficiency ratio and value of mobile transactions.

3.6 Data Collection Procedures

Prior data gathering, the investigator first obtained a formal letter for data collection from KCA University. Following this, a research permit was secured from NACOSTI, granting the necessary authorization to undertake the study. Once the permit is obtained, the investigator will visit CBK website and the official websites of the 14 microfinance banks in Kenya and obtain data on the predator variables and the response variable. Data for the study, covering the period between 2019 and 2023, was collected from these online resources.

3.7 Data Analysis and Presentation

Panel data was generated using a data collection checklist. Panel data refers to a dataset that contains observations of financial variables or metrics for multiple entities (microfinance banks) over a series of time periods (Creswell & Clark, 2021). This study covered a time period of 5 years and involved 14 microfinance banks in Kenya. By combining inferential and descriptive statistics, the researcher gained a thorough comprehension of the correlation between variables and make informed conclusions. All analysis was conducted using STATA 14. Descriptive statistics offer summary of the characteristics of the panel data, helping to understand the central tendency, dispersion, and shape of the variables (Greene & Dreyer, 2021). Some of the descriptive statistics that were utilized consist of standard deviation, frequencies, percentages, mean as well as minimum and maximum values. Inferential statistics, such as regression

analysis, helped in getting conclusions and making predictions about the population based on a sample of panel data. Tables and figures, such as line graphs, were used to present the results.

In this study, a panel regression model was utilized. A panel regression model is a statistical technique that will analyze data involving observations of various entities (like firms) across different time periods. Panel data combined elements of cross-sectional data (data obtained at a certain point in time across various entities) and time-series data (data obtained over multiple time periods for a single entity) (Hair, Page & Brunsveld, 2020). This approach allows for a deeper understanding of how individual entities change over time and how their behaviors or outcomes are influenced by both temporal and entity-specific factors. Moreover, panel regression provides more data points, increasing the statistical power of the analysis and allowing for more precise and robust conclusions regarding the relationships between variables. The regression model was as shown below;

$$FS_{it} = \beta_0 + \beta_1 MB_{1it} + \beta_2 OLP_{2it} + \beta_3 CPS_{3it} + \beta_4 IB_{4it} + \varepsilon_{it} \dots\dots\dots (2)$$

FS is dependent study variable (Financial Sustainability (operational Self-Sufficiency ratio)), β_0 symbolize Y intercept, β_1 - β_4 are coefficients of determination, MB symbolize Mobile Banking (value of mobile transactions), OLP symbolize Online Lending Platforms (value of online loans), CPS symbolize Card Payment Systems (value of card transactions), IB symbolize Internet Banking (value of internet transactions), ε = error term, t subscript symbolize time, while i subscript symbolize number of microfinance banks.

3.7.1 Diagnostic Tests

Diagnostic tests are statistical procedures used to evaluate whether the assumptions of a particular model, such as linear regression, are satisfied. These tests help identify potential issues

such as multicollinearity, heteroscedasticity, and non-normality of errors, which can affect the accuracy and validity of the model's results. The main diagnostic tests in panel data analysis include heteroscedasticity test, multicollinearity test, normality test, linearity test and Hausman test. Linearity test refers to a diagnostic procedure utilized to examine if the correlation between predictor and response variables in a regression model is linear (Patton, 2022). This test is crucial because most regression models, including linear regression, assume that the relationship between the independent and dependent variables is linear. In this research, scatter plots were utilized to test the assumption that the correlation between independent and dependent variables is linear (Punch, 2020). In scatter plots, the rule of thumb is to look for patterns to interpret relationships between variables. In scatter plots, the rule of thumb is to look for patterns that help interpret the relationships between variables. A clear linear pattern, where the data points align in a straight line, suggests a linear relationship between the predictor and response variables. A linear pattern, where points form a straight line, indicates a linear relationship (Saunders, Lewis & Thornhill, 2023).

A normality test is a statistical technique utilized to ascertain whether a dataset has a normal distribution, which is necessary for many statistical analyses and modeling techniques (Schindler, 2021). A normal distribution is a foundational assumption for several parametric tests, such as t-tests, ANOVA, and linear regression, as it ensures the reliability and validity of results. In this research, Shapiro-Wilk test was employed to assess normality. The null hypothesis for the Shapiro-Wilk test is that the data is distributed normally; if the test's p-value is below the chosen significance level, null hypothesis is rejected, demonstrating that the data is not normally distributed. This test is particularly useful for small sample sizes and is widely regarded

for its power to detect deviations from normality, ensuring that the assumptions for parametric tests are appropriately evaluated before proceeding with further analysis.

Multicollinearity test assesses the extent of association between independent variables in a regression model. High multicollinearity can make it hard to assess the precise impact of every variable on the dependent variable, potentially leading to unreliable and unstable coefficient estimates (Walliman, 2021). When multicollinearity is present, it can inflate the standard errors of the estimated coefficients, making it more difficult to determine whether a predictor variable significantly contributes to the model. In this study, VIF was used to test multicollinearity. VIF measures the degree at which multicollinearity among the predictors increases the variance of an estimated regression coefficient. A high VIF indicates that the predictor variable is highly correlated with other independent variables in the model, which can make the coefficient estimates unstable and difficult to interpret. This multicollinearity issue can inflate the standard errors of the regression coefficients, leading to less precise estimates and potentially misleading conclusions about the relationships between the predictors and the dependent variable.

Heteroscedasticity test examines whether a regression model's residual variance is consistent across all independent variable levels. The presence of heteroscedasticity indicates that the variance of errors varies, which violates a fundamental assumption of linear regression (Babbie, 2021). Ensuring that heteroscedasticity is properly addressed helps improve the validity of regression results and strengthens the reliability of conclusions drawn from the analysis. In this study, the Breusch-Pagan test was performed to detect heteroscedasticity. This test assesses if the variance of residuals depends on the values of the independent variables, which can affect the regression estimates reliability (Creswell & Clark, 2021). A significant result from the Breusch-Pagan test indicates the presence of heteroscedasticity, prompting the need for remedial

measures such as using robust standard errors to ensure reliable and valid regression results. These adjustments help mitigate the impact of heteroscedasticity, leading to more accurate coefficient estimates and standard errors, which ultimately enhance the reliability of statistical inferences drawn from the model.

Hausman test is used to examine the suitable model for panel data analysis by comparing the random and fixed effects models (Devi, 2022). This test evaluates whether the random effects model is appropriate, which assumes that explanatory variables and individual-specific effects are uncorrelated, or if the fixed effects model is preferable, which accounts for potential endogeneity by permitting individual-specific effects to be correlated with the variables (Kothari, 2023). A significant result from the Hausman test suggests that the fixed effects model should be used, as it provides more reliable and consistent estimates when individual-specific effects are correlated with the regressors. On the other hand, if the result is not significant, the random effects model is considered appropriate, as it is more efficient and computationally less demanding. The Hausman test null hypothesis is that the random effects model is consistent and efficient, implying that there is no significant endogeneity and that the random effects model is appropriate. Rejection of this null hypothesis suggests that the fixed effects model should be used instead, as it better handles the correlation between individual-specific effects and the regressors.

3.8 Ethical Considerations

Since the study was using secondary data, which includes financial and operational information, it is crucial to ensure that the data used does not breach confidentiality agreements or violate privacy laws. Therefore, the researcher ensured that the secondary data used does not violate any confidentiality agreements or privacy laws. Data was sourced from publicly available records or

shared with proper permissions, ensuring that sensitive information is anonymized or aggregated to prevent identification of specific individuals or institutions. In addition, the researcher will verify the authenticity of the secondary data obtained from the CBK and microfinance banks to ensure accuracy and reliability. All data used was cross-checked for errors, omissions, or misrepresentations, ensuring that the study's conclusions are based on credible information.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSIONS

4.1 Introduction

This chapter presents the results, interpretations, and discussions as per the objectives of the study. The general objective of the study was to examine the effect of financial technologies on financial sustainability of deposit taking microfinance banks in Kenya. The study also sought to examine the effect of mobile banking, online lending platforms, card payment systems and internet banking on financial sustainability of deposit taking microfinance banks in Kenya. The chapter begins with a descriptive analysis, followed by diagnostic tests, the Hausman test, and panel regression analysis.

4.2 Descriptive Statistics

Descriptive Statistics refers to a set of methods used to summarize and describe the main features of a dataset. It provides a way to present data in a meaningful and easily understandable form without making any inferences or predictions about the data. Table 4.1 presents the mean, standard deviation, minimum and maximum values of Financial Stability (FS) measured in terms of operational self-sufficiency ratio (operating revenue/operating expenses), Mobile Banking (MB) measured in terms of value of mobile transactions, Online lending platforms (OLP) measured in terms of value of online loans, Card Payment Systems (CPS) measured in terms of value of card transactions and Internet Banking (IB) measured in terms of value of internet transactions.

TABLE 4. 1**Descriptive Statistics**

Variable	Obs	Mean	Std. Dev.	Min	Max
FS	70	.7720714	.3793933	.07	1.665
MB	70	.9526	.7232627	.165	2.79
OLP	70	.4681571	.3114598	.1	1.255
CPS	70	.371	.2968582	.093	1.395
IB	70	.6335714	.5902724	.097	2.487

The descriptive statistics presented in Table 4.1 provide insights into the financial stability and digital financial activities of 14 deposit-taking microfinance banks (DTMs) in Kenya covering the period between 2019 and 2023. Financial Stability (FS), measured using the operational self-sufficiency ratio (operating revenue divided by operating expenses), recorded a mean of 0.7721 with a standard deviation of 0.3794, a minimum value of 0.07, and a maximum value of 1.665. These results suggest that, on average, DTMs generated about 77.2% of their operating expenses from operating revenue, pointing to challenges in attaining full operational self-sufficiency. The wide spread between the minimum and maximum values indicates that while some DTMs achieved healthy financial stability, others struggled considerably with cost recovery during the study period.

Mobile Banking (MB), measured in terms of the value of mobile transactions (in billions of Kenya Shillings), recorded a mean of 0.9526 billion KES. The standard deviation was 0.7233 billion KES, with a minimum of 0.165 billion KES and a maximum of 2.79 billion KES. This reflects a moderate level of mobile transaction activity, but the relatively high standard deviation points to substantial variations among institutions. Some microfinance banks leveraged mobile

platforms more effectively than others, possibly due to differences in digital adoption strategies, infrastructure investments, or customer bases. The figures suggest that although mobile banking was an important channel, its utilization varied widely across DTMs.

Online Lending Platforms (OLP) showed a mean value of 0.4682 billion KES, with a standard deviation of 0.3115 billion KES. The minimum recorded value was 0.1 billion KES, while the maximum reached 1.255 billion KES. The low minimum value compared to the mean suggests that several DTMs had relatively small online lending activities. Conversely, some institutions made significant use of online platforms for loan disbursement, highlighting the gradual but uneven adoption of digital lending technologies. The relatively moderate standard deviation further points to emerging but differing levels of online lending integration among DTMs during the study period.

Card Payment Systems (CPS) were relatively less prominent, with a mean transaction value of 0.371 billion KES and a standard deviation of 0.2969 billion KES. The minimum and maximum values were 0.093 billion KES and 1.395 billion KES, respectively. These results suggest that card-based payments played a supplementary role rather than being a primary transaction channel for most DTMs. The lower mean value and wide variation imply that while some DTMs invested in card infrastructure to facilitate customer transactions, a significant number continued to rely more heavily on other digital or traditional platforms.

Internet Banking (IB) transactions were considerable, posting a mean value of 0.6336 billion KES, a standard deviation of 0.5903 billion KES, a minimum of 0.097 billion KES, and a maximum of 2.487 billion KES. The figures highlight the increasing importance of internet banking, but also reveal a substantial gap between institutions. Some DTMs had well-developed

online banking platforms, offering comprehensive services, while others had relatively limited internet banking usage, possibly due to resource constraints or customer preference for mobile-based options. The wide range from minimum to maximum confirms that internet banking adoption among DTMs was varied but growing steadily.

4.3 Diagnostic Tests

Diagnostic tests are vital for evaluating the validity of assumptions and the overall performance of a panel regression model. They are essential for verifying model assumptions, identifying potential issues, and ensuring result reliability. These tests help assess whether the assumptions underlying the regression analysis, such as homoscedasticity, normality of errors, and no multicollinearity, are satisfied, which is crucial for drawing valid inferences from the model. Additionally, diagnostic tests allow for the detection of any potential specification errors, such as omitted variables or incorrect functional forms, which could bias the regression results. Tests for heteroscedasticity and multicollinearity, for example, can highlight whether the variance of the errors is constant or if independent variables are highly correlated, both of which can affect the efficiency and accuracy of the estimates. Furthermore, diagnostic checks for endogeneity and autocorrelation help ensure that the model captures the correct relationships between variables and is not suffering from omitted variable bias or serial correlation, which could distort the findings. By addressing these issues early through diagnostic testing, researchers can refine their models to ensure they produce reliable and consistent results that can be confidently used for policy or decision-making. Key diagnostic tests include linearity test, normality test, multicollinearity test, heteroscedasticity tests and Hausman tests.

4.3.1 Linearity Test

A linearity test assesses whether the relationship between independent and dependent variables in a regression model is linear. This is crucial because linear regression models assume that changes in predictor variables result in proportional changes in the response variable. Testing for linearity helps ensure that the assumptions of the regression model are met, improving the reliability and validity of the results. If the relationship between the independent and dependent variables is not linear, the model may produce biased or misleading estimates. To test linearity, scatter plots are commonly used; they visually display the relationship between two variables. If the scatter plot shows a straight-line pattern, it indicates a linear relationship. This simple visual representation allows for the immediate identification of trends, whether positive, negative, or no relationship at all. If the points are randomly scattered with no discernible pattern, it suggests a non-linear relationship, which may require a different modeling approach or data transformation. In cases where the scatter plot indicates a curved or non-linear pattern, additional transformations such as polynomial or logarithmic models may be considered to better capture the relationship between the variables. Scatter plots also help in identifying potential outliers or influential data points that could unduly affect the model's results. Therefore, by using scatter plots as an initial diagnostic tool, researchers can quickly assess the suitability of a linear model for their data or recognize the need for further refinement or alternative approaches.

FIGURE 4. 1

Scatter Plot for Card Payment Systems and Financial Stability

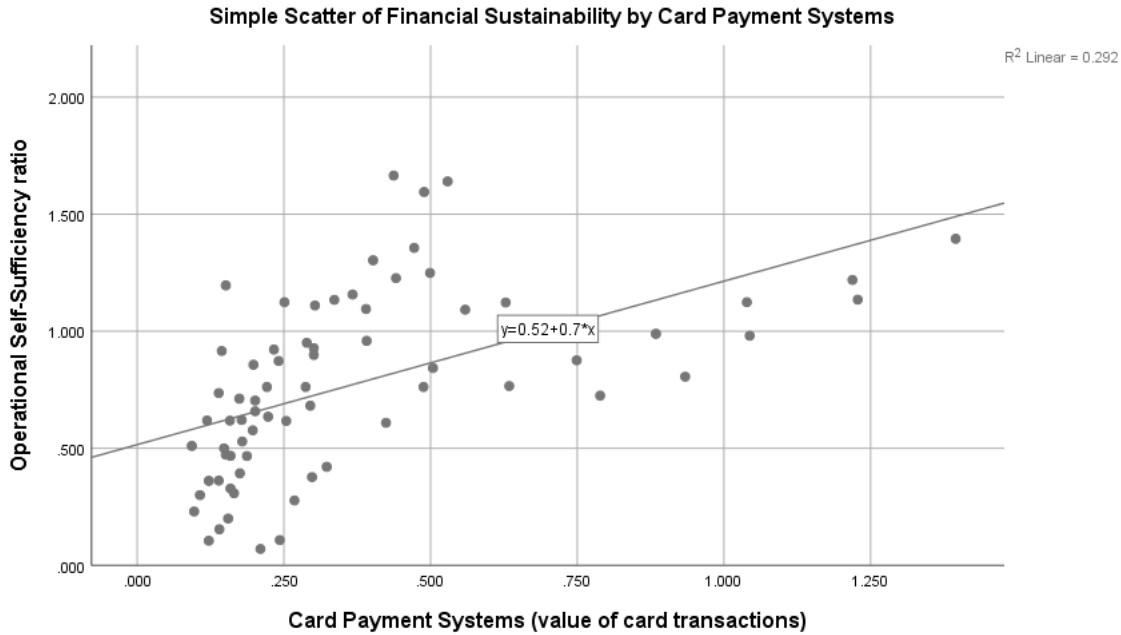


Figure 4.1 presents a simple scatter plot illustrating the relationship between financial sustainability (measured through the Operational Self-Sufficiency ratio) and card payment systems (measured as the value of card transactions in billions of Kenya Shillings) among 14 deposit-taking microfinance banks (DTMs) in Kenya between 2019 and 2023. From the graph, a positive relationship is evident between card payment systems and financial sustainability. The R^2 value of 0.314 suggests that approximately 31.4% of the variation in financial sustainability among the DTMs can be explained by differences in their card transaction volumes. As indicated by the study of Bousrih (2023), card payment systems have been shown to positively affect financial performance by enhancing transaction efficiency, which in turn contributes to the overall financial sustainability of financial institutions. This finding aligns with the research by

Yusuf et al. (2019)), which found that the adoption of card payment systems within financial institutions significantly improves their financial outcomes, mainly by expanding customer reach and reducing operational costs. The study also conform to Musa and David (2020) observations that the implementation of card payment systems streamlined transactions, resulting in faster service delivery and improved customer satisfaction. These findings further agree with Wangui and Nzuki (2021), who observed that card payment systems had a positive and substantial connection with the financial performance of microfinance institutions.

FIGURE 4. 2
Scatter Plot for Mobile Banking and Financial Stability

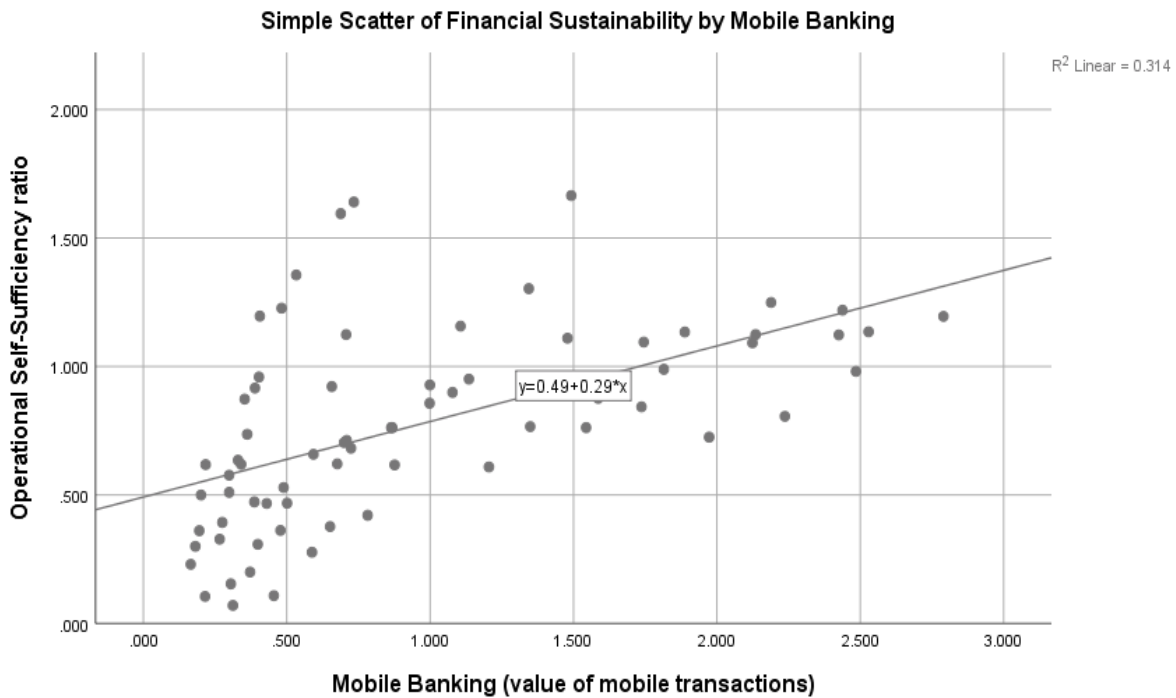


Figure 4.2 presents a simple scatter plot showing the relationship between Financial Sustainability (measured through the Operational Self-Sufficiency ratio) and Mobile Banking (measured as the value of mobile transactions in billions of Kenya Shillings) among 14 deposit-taking microfinance banks (DTMs) in Kenya between 2019 and 2023. The graph reveals a

positive relationship between mobile banking and financial sustainability. As the value of mobile banking transactions increases, the operational self-sufficiency ratio similarly tends to improve. The R^2 value of 0.314 indicates that 31.4% of the variation in financial sustainability among the DTMs can be explained by variations in mobile banking transaction volumes. This represents a stronger relationship compared to internet banking, suggesting that mobile banking plays an even more substantial role in enhancing the financial health of microfinance banks. The findings agree with Morshed et al. (2021) observation that mobile banking has a positive and significant effect on financial performance of Islamic Microfinance Institutions in Bangladesh. The findings are also in agreement with Mosoti et al. (2022) findings that mobile banking has a positive effect on operational efficiency of microfinance banks. Further, the findings conform to Abimbola, Adegoke, and David (2024) who observed that while mobile banking had a positive impact on the performance of microfinance banks, the effect was statistically insignificant. Moreover, the findings align with Uwamariya, Loebbecke, and Cremer (2020) observations that mobile banking reduces loan defaults and transfer expenses, improving operational performance, while also enhancing client outreach by enabling MFIs to serve customers in remote areas more efficiently.

FIGURE 4.3

Scatter Plot for Online Lending Platforms and Financial Stability

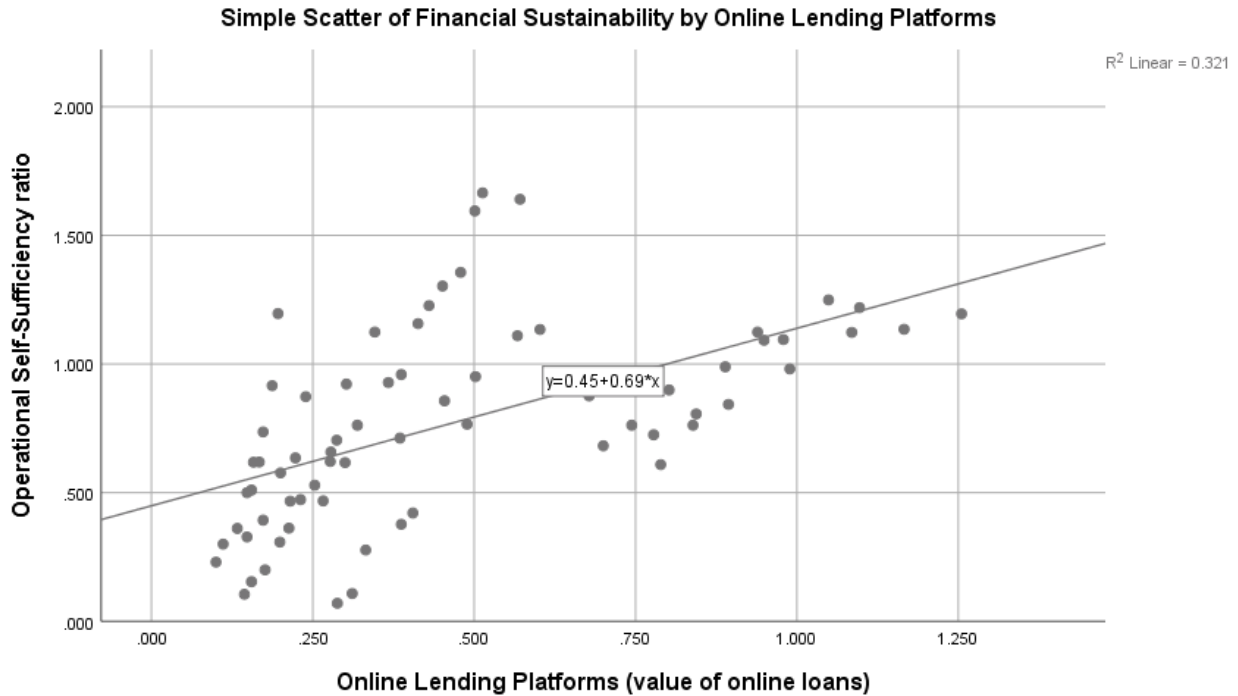


Figure 4.3 presents a simple scatter plot showing the relationship between Financial Sustainability (measured through the Operational Self-Sufficiency ratio) and Online Lending Platforms (OLP) (measured as the value of online loans in billions of Kenya Shillings) among 14 deposit-taking microfinance banks (DTMs) in Kenya between 2019 and 2023. The graph reveals a positive relationship between online lending platforms and financial sustainability. As the value of online loans increases, the operational self-sufficiency ratio tends to improve. The R^2 value of 0.321 indicates that 32.1% of the variation in financial sustainability among the DTMs can be explained by variations in online lending volumes. This represents a stronger relationship compared to mobile banking, suggesting that online lending platforms play a more significant role in enhancing the financial health of microfinance banks. In line with the results of this study,

research by Chuc et al. (2023) demonstrated that online lending platforms improve financial sustainability by increasing lending volumes and reducing administrative burdens for financial institutions. The findings also agree with Umutoni and Osiemo (2023) argument that fintech innovations, including online lending, have a significant positive effect on the financial sustainability of microfinance institutions by expanding service offerings and enhancing operational efficiencies. The findings further agree with Anyango (2021) who observed a positive and substantial correlation between the use of online lending platforms and the improved financial performance of microfinance banks. The findings are in agreement with Kiarie and Munene (2024) observations that online lending platforms had no effect on the financial performance of commercial banks.

FIGURE 4. 4
Scatter Plot for Internet Banking and Financial Stability

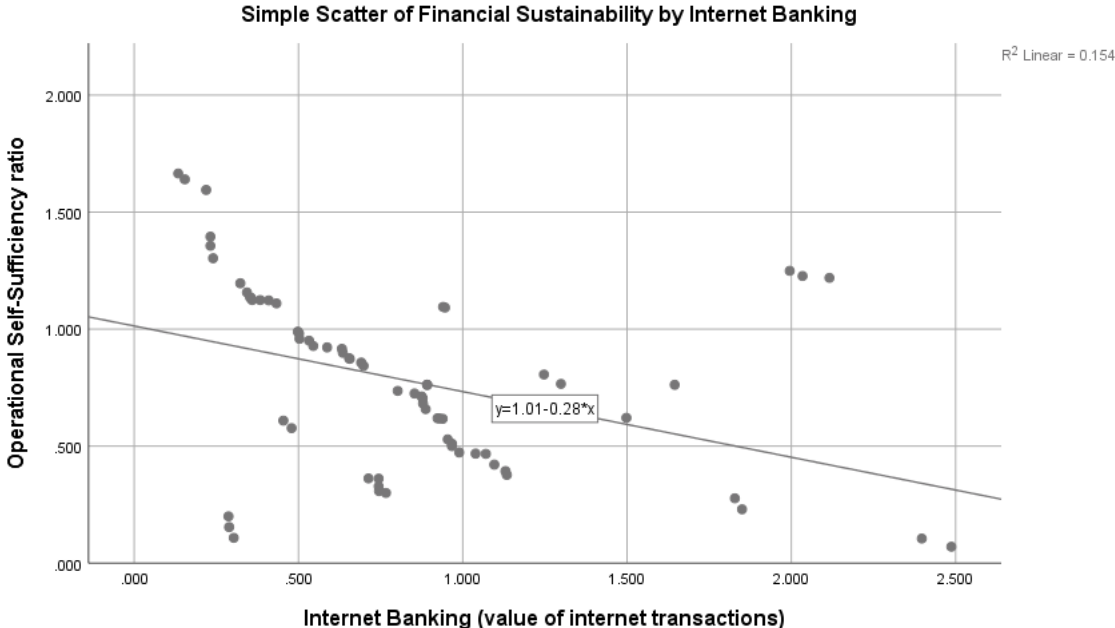


Figure 4.4 presents a simple scatter plot showing the relationship between Financial Sustainability (measured through the Operational Self-Sufficiency ratio) and Internet Banking (IB) (measured as the value of internet transactions in billions of Kenya Shillings) among 14 deposit-taking microfinance banks (DTMs) in Kenya between 2019 and 2023. The graph reveals a negative relationship between internet banking and financial sustainability. As the value of internet banking transactions increases, the operational self-sufficiency ratio tends to decrease. The R^2 value of 0.154 indicates that only 15.4% of the variation in financial sustainability among the DTMs can be explained by variations in internet banking transaction volumes. This represents a weaker relationship compared to online lending platforms, suggesting that internet banking has a less significant impact on enhancing the financial health of microfinance banks. The findings disagree with Toriki et al. (2020), who found that, in some cases, internet banking platforms positively affect the financial sustainability of microfinance banks. This is often due to high maintenance costs and low user adoption, particularly in regions with limited digital literacy. Similarly, the findings are contrary to Chukwu and Molokwu (2022), who observed that, despite the technological advancements offered by internet banking, the model's implementation often faces challenges such as high operational costs and poor uptake, which may positively affect the financial stability of microfinance banks. Further, the findings are in agreement with Kinyanjui and Ngatia (2023) observations that while internet banking had the potential to improve service delivery and operational efficiency, its impact on the profitability and growth of deposit-taking microfinance banks was limited due to low customer adoption and inadequate internet infrastructure in rural areas. Furthermore, the findings are in line with Maseko and Kalama (2022) who observed that internet banking positively and substantially influenced the financial performance of commercial banks, emphasizing its role in

enhancing operational efficiency and profitability within the industry. Also, the study findings align with Ndirangu, Kiragu and Ngunyi (2020) observations that internet banking positively impacts microfinance banks' performance by enhancing operational efficiency through the automation of loan applications and transaction processing, thereby reducing service delivery time and costs.

4.3.2 Normality Test

The normality test is important because many statistical analyses, such as regression, assume that the data follows a normal distribution. If the data deviates significantly from normality, it can lead to inaccurate results and misinterpretations. In cases where normality is violated, the statistical models may produce biased parameter estimates, invalid significance tests, and misleading conclusions. Therefore, performing a normality test helps researchers determine if data transformation or alternative non-parametric methods are necessary to ensure the validity of the analysis. By addressing these issues, researchers can improve the robustness of their findings and make more reliable inferences from their data. In this study, the Shapiro-Wilk test was used to assess the normality of the data, as it is particularly effective for small to medium-sized samples. The rule of thumb is that if the p-value from the Shapiro-Wilk test is less than 0.05, the data significantly deviates from normality, and thus, non-parametric tests may be more appropriate for further analysis. The results were as shown in Table 4.2.

TABLE 4. 2

Shapiro Wilk Test

	Statistic	df	Sig.
Mobile Banking	.987	70	.423
Online Lending Platforms	.972	70	.232
Card Payment Systems	.976	70	.389
Financial Sustainability	.982	70	.434
Internet Banking	.979	70	.339

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table 4.2 presents the results of the Shapiro-Wilk test for normality for five key variables: Mobile Banking, Online Lending Platforms, Card Payment Systems, Financial Sustainability, and Internet Banking, based on 70 observations. For all variables, the significance (Sig.) values are greater than 0.05, specifically, 0.423 for mobile banking, 0.232 for online lending platforms, 0.389 for card payment systems, 0.434 for financial sustainability, and 0.339 for internet banking. Since all p-values exceed the 0.05 threshold, we fail to reject the null hypothesis that the data are normally distributed. Therefore, the results suggest that the distributions of all five variables do not significantly deviate from normality, supporting the use of parametric statistical techniques in further analysis.

4.3.3 Multicollinearity Test

The Multicollinearity Test was conducted to assess the presence of multicollinearity among the independent variables in the regression model. Multicollinearity occurs when two or more predictors in a model are highly correlated, which can distort the estimation of coefficients and compromise the reliability of the results. When multicollinearity is present, it becomes difficult to isolate the individual effect of each independent variable on the dependent variable, as the

model cannot accurately distinguish the unique contributions of each predictor. This leads to inflated standard errors, which in turn, may cause the model to underestimate the significance of some predictors, even if they have a meaningful relationship with the outcome. Furthermore, multicollinearity can also result in unstable coefficient estimates, making the regression results unreliable and potentially misleading. Detecting and addressing multicollinearity is crucial for ensuring the integrity of the regression analysis and for drawing valid conclusions from the model. This test evaluates the Variance Inflation Factor (VIF) and tolerance values, where a VIF greater than 10 or a tolerance value less than 0.1 indicates a significant multicollinearity issue. The results were as presented in Table 4.3.

TABLE 4.3
Collinearity Statistics

Variable	VIF	1/VIF
IB	9.85	0.101566
OLP	9.71	0.102976
MB	9.10	0.109851
CPS	6.98	0.143357
Mean VIF	8.91	

Table 4.3 presents the Variance Inflation Factors (VIF) for Internet Banking (IB), Online Lending Platforms (OLP), Mobile Banking (MB), and Card Payment Systems (CPS). All variables have VIF values below the commonly accepted threshold of 10, with IB at 9.85, OLP at 9.71, MB at 9.10, and CPS at 6.98. The mean VIF is 8.91, indicating that although some values are relatively high, they do not exceed the critical level. Therefore, the results suggest that there is no serious multicollinearity among the independent variables, and they can be reliably included in the regression model.

4.3.4 Heteroscedasticity Test

The heteroscedasticity test is used to determine whether the variance of the errors in a regression model remains constant across all levels of the independent variables. In this study, the Breusch-Pagan/Cook-Weisberg test for heteroskedasticity was employed to assess this assumption. The null hypothesis of the test states that the error terms have constant variance (homoskedasticity), meaning there is no heteroskedasticity present in the model. If the p-value of the test is greater than the significance level (typically 0.05), the null hypothesis is not rejected, indicating that the variance of the errors is constant and the assumption of homoskedasticity holds. On the other hand, if the p-value is less than 0.05, the null hypothesis is rejected, suggesting the presence of heteroskedasticity. In the presence of heteroskedasticity, the efficiency of the ordinary least squares (OLS) estimates may be compromised, leading to biased standard errors and unreliable hypothesis tests. Therefore, identifying and addressing heteroskedasticity is crucial for ensuring the validity and accuracy of the regression results. The results were as shown in Table 4.4.

TABLE 4. 4

Breusch-Pagan Test for Heteroskedasticity

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of FS

chi2(1)          =      0.50
Prob > chi2     =      0.4812
```

Table 4.4 presents the results of the Breusch-Pagan/Cook-Weisberg test for heteroskedasticity, which assesses whether the variance of the errors in a regression model is

constant (homoskedasticity) or not (heteroskedasticity). The null hypothesis (H_0) of the test is that the error terms have constant variance. In this case, the test yields a chi-square statistic of 0.50 with a p-value of 0.4812. Since the p-value is greater than the conventional threshold of 0.05, we fail to reject the null hypothesis. This indicates that there is no evidence of heteroskedasticity, and the model errors can be assumed to have constant variance, satisfying one of the key assumptions of linear regression.

4.3.5 Hausman Test

The Hausman test is used to compare the fixed effects and random effects models in panel data analysis. It tests whether the unique individual effects are correlated with the regressors, which would make the random effects model inconsistent. The null hypothesis states that the random effects model is consistent, while the alternative suggests that the fixed effects model should be used. The alternative hypothesis suggests that the fixed effects model should be used, indicating that the individual-specific effects are correlated with the regressors, and therefore, the random effects model would provide biased estimates. If the p-value from the Hausman test is small (typically less than 0.05), the null hypothesis is rejected, and the fixed effects model is preferred. However, if the p-value is large, there is no evidence of correlation between the individual effects and the regressors, supporting the use of the random effects model. The Hausman test is crucial for ensuring that the chosen model is consistent and provides reliable results in panel data analysis. The results were as presented in Table 4.5.

TABLE 4.5

Hausman Test

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fixed	(B) random		
MB	.2469273	.2901528	-.0432255	.0691815
OLP	1.526427	1.013967	.5124601	.6840164
CPS	.7539794	1.098006	-.3440262	.5116438
IB	-.7343612	-.8161879	.0818267	.1098755

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$\begin{aligned} \text{chi2}(4) &= (b-B)' [(V_b-V_B)^{-1}] (b-B) \\ &= 6.36 \\ \text{Prob}>\text{chi2} &= 0.1738 \end{aligned}$$

The results of the Hausman test presented in Table 4.5 assess whether the fixed effects or random effects model is more appropriate for analyzing the relationship between financial sustainability and the four digital banking variables: Mobile Banking (MB), Online Lending Platforms (OLP), Card Payment Systems (CPS), and Internet Banking (IB). The test yields a chi-square statistic of 6.36 with a p-value of 0.1738. Since the p-value is greater than the conventional significance level of 0.05, we fail to reject the null hypothesis, which states that the difference in coefficients is not systematic. This implies that the random effects model is appropriate for this analysis, as there is no significant correlation between the individual effects and the explanatory variables.

4.4 Panel Regression Model

Panel regression is a statistical method used to analyze data that involves multiple entities (such as microfinance banks) observed over time. It combines cross-sectional and time-series data,

allowing for the examination of both individual-specific effects and temporal dynamics. This method helps to account for unobserved heterogeneity by controlling for individual characteristics that do not vary over time, which may otherwise bias the results. In addition, panel regression enables researchers to analyze the impact of both time-varying and time-invariant variables, providing a more comprehensive understanding of the factors affecting the financial performance of microfinance banks over time. This approach helps to control for unobserved heterogeneity and capture the relationships between variables more accurately. By incorporating both dimensions of variation across entities and over time panel regression enables researchers to capture the relationships between variables more accurately and account for any potential biases that might arise from ignoring these factors. Additionally, panel data models offer greater statistical power and more precise estimates by utilizing more information from the data, which can lead to more robust and reliable conclusions about the relationships between the independent and dependent variables. The regression model was as follows:

$$FS_{it} = \beta_0 + \beta_1 MB_{1it} + \beta_2 OLP_{2it} + \beta_3 CPS_{3it} + \beta_4 IB_{4it} + \varepsilon_{it} \dots\dots\dots (2)$$

FS is dependent study variable (Financial Sustainability (operational Self-Sufficiency ratio)), β_0 symbolize Y intercept, β_1 - β_4 are coefficients of determination, MB symbolize Mobile Banking (value of mobile transactions), OLP symbolize Online Lending Platforms (value of online loans), CPS symbolize Card Payment Systems (value of card transactions), IB symbolize Internet Banking (value of internet transactions), ε = error term, t subscript symbolize time, while i subscript symbolize number of microfinance banks.

TABLE 4. 6

Panel Regression Results

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Random-effects GLS regression           Number of obs   =       70
Group variable: No_MB                  Number of groups =       14

R-sq:  within = 0.6250                 Obs per group:  min =       5
      between = 0.4089                   avg =           5.0
      overall = 0.4383                   max =           5

                                           Wald chi2(4)    =      88.50
corr(u_i, X) = 0 (assumed)             Prob > chi2     =      0.0000
    
```

FS	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
MB	.2901528	.1256064	2.31	0.021	.0439688	.5363367
OLP	1.013967	.5259931	1.93	0.054	-.016961	2.044894
CPS	1.098006	.4932019	2.23	0.026	.1313477	2.064663
IB	-.8161879	.239048	-3.41	0.001	-1.284713	-.3476625
_cons	.1307295	.1132969	1.15	0.249	-.0913283	.3527872
sigma_u	.28533741					
sigma_e	.14394287					
rho	.7971396	(fraction of variance due to u_i)				

Based on the regression results from the random-effects GLS model, the revised regression equation for the study on financial technologies and financial sustainability (FS) of deposit-taking microfinance banks (DTMs) in Kenya is as follows;

$$FS_{it} = 0.13073 + 0.29053MB_{1it} + 1.01396OLP_{2it} + 1.098006CPS_{3it} + 0.816187IB_{4it}$$

The random-effects generalized least squares (GLS) regression model, based on 70 observations across 14 deposit-taking microfinance banks (DTMs), demonstrates a good model

fit. The within R-squared value of 0.6250 indicates that 62.5% of the variation in financial sustainability (FS) within banks over time is explained by the included variables: Mobile Banking (MB), Online Lending Platforms (OLP), Card Payment Systems (CPS), and Internet Banking (IB). The overall R-squared of 0.4383 suggests that approximately 43.83% of the total variation in financial sustainability, combining both within and between bank differences, is explained by the model. The Wald chi-square statistic of 88.50 with a p-value of 0.0000 confirms that the model is statistically significant, and the independent variables jointly influence financial sustainability.

The results indicate that mobile banking has a positive and statistically significant effect on the financial sustainability of microfinance banks ($\beta_1 = 0.2902$, $p = 0.021$). This means that an increase in the value of mobile banking transactions is associated with improved operational self-sufficiency. The positive coefficient suggests that mobile banking contributes to enhanced financial outcomes, likely due to its widespread adoption, accessibility, and cost-effectiveness in reaching a large customer base. These findings support the notion that mobile platforms are an important tool for improving service delivery and expanding financial access, ultimately boosting institutional sustainability. The findings of this study align with those of Ndirangu et al. (2020), who found that mobile banking platforms improve financial sustainability by reducing operational costs and increasing access to services. Similar results were reported by Ondago (2024), who concluded that mobile banking contributes significantly to the operational self-sufficiency of microfinance institutions, enabling them to serve a broader client base efficiently. The findings align with the Unified Theory of Acceptance and Use of Technology (UTAUT), as the significant impact of mobile banking on financial sustainability reflects users' behavioral intention driven by performance expectancy, effort expectancy, and facilitating conditions.

The results indicate that online lending platforms have a positive and insignificant effect on the financial sustainability of microfinance banks ($\beta_2 = 1.0140$, $p = 0.054$). This means that an increase in the value of loans disbursed through digital platforms is associated with improved operational self-sufficiency. While the association is not strongly significant, the positive coefficient suggests that online lending platforms contribute to enhanced financial outcomes, likely due to the reduced operational costs and expanded customer reach they offer. These findings imply that online lending platforms can play a crucial role in improving financial sustainability by offering a more efficient and scalable model for lending. This finding are contrary to Anyango (2021), which demonstrated that online lending platforms foster financial sustainability by improving access to funds and reducing the cost of credit provision for financial institutions. According to the study by Kiarie and Munene (2024), the adoption of peer-to-peer and online lending platforms leads to better financial sustainability by enhancing liquidity and improving loan recovery rates. The findings align with the Diffusion of Innovation Theory, suggesting that while online lending platforms are still in the early stages of adoption, their relative advantage and scalability present potential for broader acceptance and eventual positive impact on financial sustainability.

Card payment systems have a positive and statistically significant effect on financial sustainability ($\beta_3 = 1.0980$, $p = 0.026$). This implies that an increase in card-based transactions is linked to improved operational efficiency and financial outcomes among microfinance banks. The significance of this result highlights the role of digital payment infrastructure in enhancing revenue generation and reducing transaction-related inefficiencies. The finding may reflect growing consumer adoption of cards for convenience and security, alongside institutional benefits such as streamlined operations and better financial tracking. Therefore, card payment

systems represent a valuable component of the digital banking ecosystem that can contribute to the financial health of DTMs in Kenya. The findings of this study are consistent with the work of Musa and David (2020), which demonstrated that innovations in payment systems, such as card payments, help microfinance institutions optimize operations and improve their financial sustainability. According to Wangui and Nzuki (2021), card payment systems enhance financial health by improving cash flow, reducing transaction delays, and expanding financial services, thereby fostering long-term sustainability. The findings align with the Resource-Based View (RBV) theory by demonstrating that card payment systems serve as a strategic internal resource, valuable, rare, inimitable, and well-organized, that enhances the operational efficiency and financial sustainability of microfinance banks through improved service delivery, revenue generation, and cost reduction.

Contrary to expectations, internet banking shows a statistically significant negative effect on financial sustainability ($\beta_4 = -0.8162, p = 0.001$). This suggests that as the volume of internet-based transactions increases, operational self-sufficiency tends to decline. The negative coefficient may indicate that internet banking services, while technologically advanced, are not yet optimized or fully aligned with the business models of microfinance banks, possibly due to low user uptake, high maintenance costs, or limited digital literacy among target clients. Additionally, internet banking is often used for larger transactions, which may strain the efficiency of microfinance banks, as these institutions are typically focused on smaller, more frequent transactions. The findings disagree with Kinyanjui and Ngatia (2023), who found that internet banking had no substantial effect on the financial performance of Kenyan deposit-taking microfinance institutions. In addition, the findings disagree with Maseko and Kalama (2022), who concluded that internet banking positively and substantially influenced the financial

performance of Tanzanian commercial banks by enhancing operational efficiency and profitability. The findings reflect limitations in both the UTAUT and Diffusion of Innovation theories, suggesting that despite internet banking's technological potential (innovation), low user acceptance, poor performance expectancy, and lack of compatibility with microfinance banking models hinder its effective adoption and impact.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The chapter presents a comprehensive overview of the study's findings, conclusions, and recommendations. This chapter begins with a summary of the key findings, followed by a conclusion drawn from the analysis, and concludes with recommendations for both practice and further research. The aim of this chapter is to synthesize the study's outcomes and provide guidance for enhancing financial sustainability in deposit-taking microfinance banks in Kenya.

5.2 Summary of the Findings

The section presents a summary of the findings, highlighting the effects of mobile banking, online lending platforms, card payment systems, and internet banking on the financial sustainability of deposit-taking microfinance banks in Kenya.

5.2.1 Mobile Banking and Financial Sustainability

The study found a positive and statistically significant relationship between mobile banking and the financial sustainability of microfinance banks in Kenya, as measured by the Operational Self-Sufficiency (OSS) ratio. The OSS ratio, which compares operating revenue to operating expenses, indicates the bank's ability to cover its costs without external support. As mobile banking transaction volumes increase, microfinance banks are able to generate more revenue while simultaneously reducing operational expenses, thanks to the efficiency and scalability of mobile platforms. This positive impact suggests that mobile banking not only enhances financial inclusion by reaching a larger customer base but also contributes to improved operational

performance by lowering the costs associated with traditional banking methods. The results highlight mobile banking as a key driver of financial sustainability, underlining its role in reducing transaction costs and improving revenue generation, which is essential for the long-term viability of microfinance institutions in Kenya. This aligns with the broader trend of digital banking transforming the financial sector by offering cost-effective and scalable solutions for banks to enhance their financial health.

Moreover, the integration of mobile banking into microfinance operations has fostered greater customer engagement and improved service delivery. With mobile banking, clients can conveniently access their accounts, make transactions, and apply for loans without the need to visit physical branches, thus saving time and travel costs. This ease of access enhances customer satisfaction and loyalty, which in turn contributes to the stability and growth of microfinance banks. Additionally, mobile banking facilitates real-time data collection and analysis, enabling banks to monitor financial trends, detect fraud, and make informed decisions quickly. By leveraging these digital tools, microfinance institutions can tailor financial products to meet the unique needs of their diverse clientele. The study underscores that the adoption of mobile technology is not merely a cost-cutting measure, but a strategic investment in innovation and service quality. As digital finance continues to evolve, mobile banking will remain a pivotal element in the sustainability and competitiveness of microfinance banks in Kenya. Furthermore, the widespread use of mobile banking has enabled microfinance banks to increase financial inclusion.

5.2.2 Online Lending Platforms and Financial Sustainability

The results of the study indicate that online lending platforms have a positive, but statistically insignificant, effect on the financial sustainability of microfinance banks in Kenya, as measured by the Operational Self-Sufficiency (OSS) ratio, which compares operating revenue to operating expenses. While the positive relationship suggests that an increase in the value of online loans may potentially improve financial sustainability by expanding the bank's loan portfolio and revenue generation, the lack of statistical significance implies that this relationship may not be strong or consistent enough to drive substantial improvements in the financial health of microfinance institutions. The absence of a significant effect could be attributed to several factors, such as limited customer adoption of online lending platforms, potential operational inefficiencies, or the relatively nascent stage of digital lending in the Kenyan microfinance sector. As such, while online lending platforms may offer opportunities for growth and diversification of income sources, their impact on the financial sustainability of microfinance banks appears to be more limited at present, suggesting that other factors may play a more critical role in enhancing financial performance.

Furthermore, the limited impact of online lending platforms on financial sustainability may also stem from challenges related to regulatory compliance, credit risk management, and digital literacy among target customers. Many microfinance clients, particularly in rural or underserved areas, may lack access to smartphones, reliable internet, or the technical know-how to utilize online lending services effectively. This digital divide can hinder the full adoption and utilization of these platforms, reducing their overall effectiveness. Additionally, concerns around loan defaults and fraud in the online lending space may compel microfinance banks to adopt more cautious approaches, limiting their investment and operational expansion in digital lending. The

infancy of such platforms also means that institutions may still be refining their digital lending models, risk assessment tools, and customer outreach strategies. Consequently, while online lending holds potential as an innovative tool for expanding financial services, its current contribution to financial sustainability remains marginal, necessitating further investment, infrastructure development, and client education to realize its full potential.

5.2.3 Card Payment Systems and Financial Sustainability

The study found that card payment systems have a positive and statistically significant effect on the financial sustainability of microfinance banks in Kenya, as indicated by the Operational Self-Sufficiency (OSS) ratio, which measures the relationship between operating revenue and operating expenses. The positive relationship suggests that an increase in card transactions contributes to enhanced financial sustainability by generating more revenue through transaction fees, expanding the customer base, and improving the efficiency of banking services. This is particularly relevant in a market where convenience, accessibility, and financial inclusion are key factors driving customer engagement and service uptake. The statistically significant result underscores that card payment systems are a valuable tool for microfinance banks, not only in terms of offering an additional revenue stream but also in terms of improving operational efficiency and reducing costs associated with traditional banking methods. This finding aligns with the growing trend of digital payment adoption in Kenya, where card payment systems are seen as essential for increasing the reach and financial viability of microfinance institutions.

In addition to increasing revenue and improving operational efficiency, card payment systems also foster customer trust and loyalty by offering secure and convenient methods for conducting financial transactions. The integration of card services enables microfinance banks to offer

modern banking experiences, which are increasingly expected by clients, particularly in urban and peri-urban areas. Furthermore, card payment infrastructure, such as point-of-sale (POS) terminals and ATM networks, allows microfinance institutions to expand their service delivery channels without incurring the high costs of establishing new physical branches. This enhances service accessibility, especially in areas where traditional banking services are limited. As a result, customers are more likely to transact frequently, deposit savings, and access credit services, all of which contribute to improved bank revenues and cost-efficiency. By embracing card payment systems, microfinance banks in Kenya position themselves to compete effectively with larger financial institutions while also promoting financial inclusion and supporting long-term financial sustainability. Moreover, the adoption of card payment systems supports the collection of valuable transactional data, which microfinance banks can analyze to gain insights into customer behavior, preferences, and financial needs.

5.2.4 Internet Banking and Financial Sustainability

The study revealed that, contrary to expectations, internet banking has a statistically significant negative effect on the financial sustainability of microfinance banks in Kenya, as measured by the Operational Self-Sufficiency (OSS) ratio. This negative relationship suggests that as the value of internet transactions increases, the operational self-sufficiency ratio tends to decline. A possible explanation for this could be that internet banking is primarily used for larger transactions, which often require more complex systems, higher operational costs, and increased security measures. Microfinance banks, which typically operate on smaller margins and serve a broader base of clients with lower-value transactions, may struggle to effectively manage these high-cost transactions. Additionally, while internet banking can provide convenience and efficiency, it may not yet be fully optimized for the business models of microfinance institutions,

leading to inefficiencies and higher overhead costs. This finding highlights the need for microfinance banks to reassess their internet banking strategies, especially considering the larger, more costly transactions that may be detracting from their overall financial sustainability.

Moreover, the negative impact of internet banking on financial sustainability may also stem from the limited digital literacy and infrastructure among the primary clientele of microfinance banks. Many customers in rural or underserved areas may lack access to reliable internet connections, smartphones, or the skills needed to navigate online platforms effectively. As a result, investments made by microfinance banks in internet banking platforms may not yield immediate returns, leading to underutilization of these services. Additionally, the costs associated with maintaining and upgrading secure digital platforms, training personnel, and ensuring regulatory compliance can significantly strain the already limited financial resources of these institutions. Unlike mobile banking, which is often more accessible and user-friendly for low-income populations, internet banking might not align well with the habits and capacities of the typical microfinance client base. Therefore, unless properly tailored and supported by widespread digital education and infrastructure development, internet banking may continue to hinder rather than enhance financial sustainability for microfinance institutions. Furthermore, the adoption of internet banking by microfinance institutions may face resistance from clients who are more accustomed to traditional banking methods, such as in-person interactions.

5.3 Conclusion

The study concludes that mobile banking has a positive and significant effect on the financial sustainability of microfinance banks in Kenya. This implies that as mobile banking transactions increase, microfinance banks are better able to generate revenue while reducing operational costs, thereby improving their financial sustainability. Mobile banking enhances accessibility and

efficiency, contributing to a broader customer base and reduced transaction costs. Consequently, it plays a critical role in the long-term viability of microfinance institutions, emphasizing the importance of embracing digital banking as a key driver of financial health. Mobile banking offers microfinance banks the ability to reach underserved and remote populations, which enhances financial inclusion, thus broadening their customer base and providing opportunities for further growth and development in the sector.

In addition, the study concludes that online lending platforms have a positive but statistically insignificant effect on the financial sustainability of microfinance banks in Kenya. This implies that while online lending platforms may offer opportunities for expanding the loan portfolio and revenue generation, their impact on the financial sustainability of microfinance institutions is currently limited. The insignificant effect could be due to factors such as low customer adoption, operational inefficiencies, or the early stages of digital lending in Kenya. Therefore, while these platforms may hold potential for growth, other factors are likely more influential in driving financial sustainability. Moreover, the lack of a significant effect may also be attributed to the regulatory environment, which may still be evolving and limiting the full integration of digital lending services within the broader financial system.

Further, the study concludes that card payment systems have a positive and statistically significant effect on the financial sustainability of microfinance banks in Kenya. This implies that as the volume of card transactions increases, microfinance banks can generate more revenue, improve operational efficiency, and expand their customer base. Card payment systems serve as a valuable tool for revenue generation and cost reduction, aligning with the growing trend of digital payment adoption in Kenya. This finding underscores the importance of embracing diverse payment solutions to enhance the financial stability and growth of microfinance

institutions. The widespread adoption of card payment systems enables microfinance banks to remain competitive in an increasingly digital financial landscape, offering their clients convenient and secure transaction methods while positioning themselves for sustainable growth and long-term profitability.

Moreover, the study concludes that internet banking has a statistically significant negative effect on the financial sustainability of microfinance banks in Kenya. This implies that despite the potential advantages of internet banking, such as convenience and efficiency, its use for large transactions may lead to higher operational costs and inefficiencies, negatively impacting financial sustainability. Microfinance banks, which primarily operate on smaller margins, may struggle to manage the complexities and costs associated with internet banking, suggesting the need for a reassessment of their internet banking strategies to ensure alignment with their business models and financial health. The challenges of low customer adoption, limited infrastructure in rural areas, and the need for continuous system maintenance may exacerbate the negative effects on financial performance.

5.4 Recommendations

The study found a positive and statistically significant relationship between mobile banking and the financial sustainability of microfinance banks in Kenya. Building on these findings, this study recommends that microfinance banks continue to expand and optimize their mobile banking services by enhancing platform accessibility, integrating innovative features, and increasing customer education. Such efforts will help scale mobile banking transactions, reduce operational costs, and boost revenue generation, contributing to improved financial sustainability. Additionally, collaboration with telecom companies or mobile payment providers

could further enhance service efficiency and ensure long-term financial health. Moreover, microfinance banks should focus on ensuring that their mobile banking platforms are secure and user-friendly, as this will foster trust and encourage greater adoption among their clientele, particularly those in rural and underserved areas.

The study found that online lending platforms have a positive, but statistically insignificant, effect on the financial sustainability of microfinance banks in Kenya. In light of these results, this study recommends that microfinance banks invest in improving the user experience and customer adoption of online lending platforms, addressing operational inefficiencies and offering tailored loan products. By enhancing customer engagement, improving loan processing times, and boosting digital literacy, microfinance banks can unlock the full potential of online lending platforms and eventually strengthen their financial sustainability. Furthermore, microfinance banks should focus on integrating robust credit risk assessment tools and fraud prevention measures into their online lending platforms to minimize default rates and enhance the reliability of loan products.

The study found that card payment systems have a positive and statistically significant effect on the financial sustainability of microfinance banks in Kenya. Given these findings, this study recommends that microfinance banks continue to integrate and expand card payment systems, investing in more point-of-sale (POS) infrastructure and exploring partnerships with global payment networks. By improving customer education and increasing transaction volumes, microfinance banks can enhance their revenue from transaction fees, improve operational efficiency, and ensure long-term financial viability. Moreover, microfinance banks should focus on expanding their card payment services to reach underserved areas, where access to traditional banking services is limited. By offering convenient and secure payment methods, microfinance

institutions can attract a larger customer base, including small businesses and individuals who rely on cash-based transactions.

The study revealed that internet banking has a statistically significant negative effect on the financial sustainability of microfinance banks in Kenya. In response to this outcome, this study recommends that microfinance banks reassess their internet banking strategies, focusing on optimizing cost structures for larger transactions while ensuring alignment with the needs of their clients. Banks should consider offering tiered service options to better manage costs, invest in security improvements, and enhance technological infrastructure, all of which can help mitigate the negative impact on financial sustainability. "Additionally, microfinance banks should invest in targeted digital literacy programs to ensure that their customers, especially those in rural and underserved areas, are equipped with the skills necessary to use internet banking effectively.

5.5 Recommendations for Further Research

The study aimed to examine the effect of financial technologies on the financial sustainability of deposit-taking microfinance banks in Kenya. The findings revealed that these financial technologies, specifically mobile banking, online lending platforms, card payment systems, and internet banking, explained an overall 43.83% of the variation in financial sustainability. This indicates that while financial technologies play a significant role in influencing financial sustainability, other factors not covered in this study may also contribute to the financial health of microfinance banks. Therefore, future studies should explore additional variables, such as management practices, regulatory factors, or external economic conditions that could further impact the financial sustainability of deposit-taking microfinance banks. Furthermore, this study focused on financial sustainability as measured by the Operational Self-Sufficiency ratio. Future

research should consider other measures of financial sustainability, such as profitability or liquidity ratios, to provide a more comprehensive understanding of the effects of financial technologies on the sector.

REFERENCES

- Abimbola, A., Adegoke, K., & David, A. (2024) Effect of Electronic Payment Systems on the Performance of Microfinance Banks in Nigeria. *Journal of Business*, 8(1), 1-12.
- Agboola, O. & Eze, B. U. (2023). Effect of financial technology on the survival of micro-enterprises. *International Journal of Entrepreneurial Knowledge*, 11(1), 1-13.
- Anyango, M. (2021). *Effects of Digitalization on Financial Performance of Microfinance Banks in Kenya*. Retrieved from <https://erepository.uonbi.ac.ke/>
- Asante, K., & Amankwah, P. (2021). The role of financial technology in promoting financial inclusion in Ghana's microfinance sector. *African Journal of Finance and Banking Research*, 14(2), 87-103.
- Asian Development Bank (ADB). (2022). *FinTech and Financial Inclusion in Asia: Emerging Trends and Policy Implications*. ADB Publications.
- Awaworyi, S. (2020). Microfinance financial sustainability and outreach: is there a trade-off?. *Empirical Economics*, 59(3), 1329-1350.
- Ayaz, A., & Yanartaş, M. (2020). An analysis on the unified theory of acceptance and use of technology theory (UTAUT): Acceptance of electronic document management system (EDMS). *Computers in Human Behavior Reports*, 2, 100032.
- Babbie, E. R. (2021). *The practice of social research* (15th ed.). Belmont, CA: Wadsworth Publishing Company.

- Bajunaied, K. (2023). Behavioral intention to adopt FinTech services: An extension of unified theory of acceptance and use of technology. *Journal of Open Innovation: Technology, Market, and Complexity*, 9(1), 100010.
- Banna, H. & Yarovaya, L. (2022). Fintech-based financial inclusion and risk-taking of microfinance institutions (MFIs): Evidence from Sub-Saharan Africa. *Finance Research Letters*, 45, 102149.
- Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99-120.
- Barney, J. B., Ketchen Jr, D. J., & Wright, M. (2021). Bold voices and new opportunities: an expanded research agenda for the resource-based view. *Journal of Management*, 47(7), 1677-1683.
- Benami, E., & Carter, M. R. (2021). Can digital technologies reshape rural microfinance? Implications for savings, credit, & insurance. *Applied Economic Perspectives and Policy*, 43(4), 1196-1220.
- Benhabib, J. & Tonetti, C. (2021). Reconciling models of diffusion and innovation: A theory of the productivity distribution and technology frontier. *Econometrica*, 89(5), 2261-2301.
- Bousrih, J. (2023). The impact of digitalization on the banking sector: Evidence from fintech countries. *Asian Economic and Financial Review*, 13(4), 269-278.
- Bryman, A. (2022). *Social research methods* (5th ed.). Oxford: Oxford University Press.
- Central Bank of Kenya (2022). *Bank Supervision Annual Report 2022*. Retrieved from <https://www.centralbank.go.ke>

- Central Bank of Kenya (2023). *Bank Supervision Annual Report 2023*. Retrieved from <https://www.centralbank.go.ke>
- Chauhan, S. & Kumar, C. V. (2024). Effect of capital structure on the financial and social performance of Indian microfinance institutions. *FIIB Business Review*, 13(2), 243-256.
- Chelangat, M. N., Kiprop, S., & Mutai, J. K. (2022). Effects of Payment Cards on Financial Performance of Commercial Banks in Kenya. *Journal of Finance and Accounting*, 6(1), 46-56.
- Chuc, A. A. M., Atayah, A. A., & Özer, S. Q. (2023). Impact of Financial Technology (Fintech) on Financial Performance of Micro Finance Institutions in Bahrain. *African Journal of Emerging Issues*, 5(17), 1-11.
- Chukwu, K. O., & Molokwu, S. R. (2022). Effects of Digital Banking on the Performance of Commercial Banks in Nigeria 2010-2019. *International Journal of Multidisciplinary Research and Analysis*, 5(2), 133-148.
- Comite, U. & Miculescu, A. (2022). Achieving financial sustainability through revenue diversification: A green pathway for financial institutions in Asia. *Sustainability*, 14(6), 3512.
- Creswell, J. W., & Clark, V. L. (2021). *Designing and conducting mixed methods research* (4th ed.). Thousand Oaks, CA: Sage Publications.
- Creswell, J. W., & Creswell, J. D. (2022). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
- Cuadrado-Ballesteros, B. (2022). Budget transparency and financial sustainability. *Journal of Public Budgeting, Accounting & Financial Management*, 34(6), 210-234.

- Dang, T. T., & Vu, H. Q. (2020). Fintech in Microfinance: a new direction for Microfinance institutions in Vietnam. *Asian Journal of Business Environment*, 10(3), 13-22.
- Dasilas, A. (2023). The impact of FinTech firms on bank performance: Evidence from the UK. *EuroMed Journal of Business*, 12(8), 90-112.
- Devi, P. S. (2022). *Research methodology: A handbook for beginners*. New Delhi: Notion Press.
- Doran, N. M., Bădîrcea, R. M., & Manta, A. G. (2022). Digitization and Financial Performance of Banking Sectors Facing COVID-19 Challenges in Central and Eastern European Countries. *Electronics*, 11(21), 3483.
- Gerhart, B., & Feng, J. (2021). The resource-based view of the firm, human resources, and human capital: Progress and prospects. *Journal of management*, 47(7), 1796-1819.
- Githaiga, P. N. (2022). Revenue diversification and financial sustainability of microfinance institutions. *Asian Journal of Accounting Research*, 7(1), 31-43.
- Gleibner, W., Günther, T., & Walkshausl, C. (2022). Financial sustainability: measurement and empirical evidence. *Journal of Business Economics*, 92(3), 467-516.
- Gonzalez, J. R., Martinez, F., & Suarez, L. (2021). The influence of digital financial services on microfinance institutions in Latin America. *Journal of Digital Banking and Financial Innovation*, 8(3), 112-129.
- Greene, J. C., & Dreyer, L. A. (2021). *Designing & conducting mixed methods research* (3rd ed.). Thousand Oaks, CA: Sage Publications.
- Hair, J. O., Page, M., & Brunsveld, N. (2020). *Essentials of business research methods*. London: Routledge.

- Hall, R. (2020). *Qualitative, quantitative and combined methods: Mixing methods in social research*. New York, NY: SAGE Publications Ltd.
- Jelincic, D. A., & Sveb, M. (2021). Financial sustainability of cultural heritage: A review of crowdfunding in Europe. *Journal of Risk and Financial Management*, 14(3), 101.
- Khanra, S., Kaur, P. & Dhir, A. (2022). A resource-based view of green innovation as a strategic firm resource: Present status and future directions. *Business Strategy and the Environment*, 31(4), 1395-1413.
- Kiarie, K., & Munene, R. (2024). Effect of digital credit on the financial performance of commercial banks in Kenya. *International Academic Journal of Economics and Finance*, 4(1), 368-386.
- Kinyanjui, P., & Ngatia, P. (2023). Digital Technologies and Financial Performance of Deposit-Taking Microfinance Institutions in Kenya. *International Journal of Economics, Commerce and Management*, 11(10),
- Kothari, C. R. (2023). *Research methodology: Methods and techniques* (5th ed.). New Delhi: New Age International Publishers.
- Krishna, B. (2020). *Guide to research methodology and biostatistics*. London: Rutledge.
- Latwal, G. S. (2020). *Research methodology*. Florida: CRC Press.
- Lee, J. W. (2021). Diffusion of innovations. In *Encyclopedia of sport management*. Edward Elgar.
- Liu, H., & Chen, X. (2023). Digital finance and the sustainability of microfinance institutions: Evidence from China. *Asian Economic Review*, 35(4), 221-238.

- Maeenuddin, H. & Jermstittiparsert, K. (2024). Measuring the Financial Sustainability and its Influential Factors in Microfinance Sector of Pakistan. *Sage Open*, 14(3), 215-221.
- Maina, C.E. (2024). Financial Technology and Financial Inclusion in the Banking industry in Kenya. *East African Scholars Journal of Economics, Business and Management*, 7(6), 226-234.
- Maseko, F. E., & Kalama, A. (2022). The Effect of Electronic Banking on Commercial Banks' Financial Performance in Tanzania. *The Journal of Informatics*, 2(1), 33-53.
- Memba, F., & Muriithi, J. (2023). Credit risk and financial performance of microfinance banks in Kenya. *IOSR Journal of Economics and Finance (IOSRJEF)*, 14(1), 67-74.
- Memon, A., Akram, W. & Yasmin, I. (2022). Financial sustainability of microfinance institutions and macroeconomic factors: a case of South Asia. *South Asian Journal of Macroeconomics and Public Finance*, 11(1), 116-142.
- Mia, M. A. (2023). Technological change and innovations in microfinance institutions: What matters?. *Global Business Review*, 24(6), 1454-1467.
- Microfinance Information Exchange (MIX). (2022). *Global Microfinance Industry Report: Trends and Challenges in Developing Economies*. Washington, DC.
- Microfinance Information Exchange (MIX). (2022). *Global trends in microfinance: The economic impact of microfinance institutions*. Retrieved from <https://www.themix.org>
- Mokaya, B. N. (2020). *Effects of Financial Technology on the Financial Performance of Tier II Banks in Kenya*. Retrieved from <http://erepo.usiu.ac.ke/11732/6032>

- Morshed, M. N., Ali, M. C., & Bari, S. S. (2021). Effects of Mobile Banking on the Performance of Islamic Microfinance Institutions in Bangladesh. *International Journal of Innovative Research and Publications 1(4)*, 21-30
- Mosoti, J. M., Wafula, J., & Nyangâ, A. (2022). Effect of Mobile Banking Technology on the Financial Performance of Deposit-Taking Microfinance Institutions in Kenya. *International Research Journal of Economics and Finance, 4(3)*.
- Musa, A. & David. J. (2020) The Effect of Card Payment Systems on Financial Performance of Microfinance Banks in Niger State. *Journal Bisnis dan Manajemen 9 (2)*, 143 - 154
- Naz, F. & Ali, R. (2019). Determinants of financial sustainability of microfinance institutions in Pakistan. *Manager, 10(4)*, 51-64.
- Ndirangu, E. W., Kiragu, D., & Ngunyi, A. (2020). Effect of Mobile Banking on Performance of Microfinance Banks in Kenya. *European Journal of Business and Strategic Management, 5(2)*, 64-78.
- Ndlovu, T., & Mashamba, T. (2023). The role of mobile banking in improving financial sustainability of microfinance institutions in South Africa. *South African Journal of Economic Studies, 17(1)*, 56-78.
- Ndungu, J. M., & Moturi, C. A. (2020). Determinants of mobile Fintech uptake in Kenyan microfinance sector. *Current Journal of Applied Science and Technology, 39(28)*, 102-114.
- Okafor, I., & Adegbite, O. (2022). Financial technology adoption and loan repayment performance in Nigerian microfinance institutions. *West African Financial Review, 11(2)*, 34-52.

- Okoro, C., Nnam, H. & Etukudo, W. (2024). Impact of financial technology on financial institutions' performance. Evidence from Nigerian commercial banks. *International Journal of Accounting and Financial Management Research*, 10(1), 111-134.
- Ondago, W. M. (2024). *The Relationship between mobile banking and financial performance of microfinance banks in Kenya*. Retrieved from <https://su-plus.strathmore.edu>.
- Otieno, O. S. (2020). Adoption of digital banking technology and financial performance of commercial banks in Kenya. *International Journal of Current Aspects in Finance, Banking and Accounting*, 2(1), 42-50.
- Ozili, P. K. (2023). Financial inclusion and FinTech in developing countries: An overview. *International Journal of Financial Studies*, 15(2), 78-95.
- Parvin, A., & Cao, Y. (2020). The global impact of microfinance institutions on poverty alleviation: An empirical review. *World Bank Research Papers*, 2020/07, 1-24.
- Parvin, S. S. & Cao, Q. (2020). Capital structure, financial performance, and sustainability of micro-finance institutions (MFIs) in Bangladesh. *Sustainability*, 12(15), 6222.
- Patton, M. Q. (2022). *Qualitative research & evaluation methods: Integrating theory and practice* (4th ed.). Thousand Oaks, CA: SAGE Publications.
- Pinho, C., Franco, M., & Mendes, L. (2021). Application of innovation diffusion theory to the E-learning process: higher education context. *Education and Information Technologies*, 26(1), 421-440.
- Punch, K. F. (2020). *Introduction to social research methodology* (3rd ed.). Thousand Oaks, CA: Sage Publications.
- Rogers, E. M. (1962). *Diffusion of innovations* (1st ed.). Free Press.

- Saunders, M., Lewis, P., & Thornhill, A. (2023). *Research methods for business students* (9th ed.). Harlow, England: Pearson Education.
- Schindler, P. S. (2021). *Business research methods* (14th ed.). New York, NY: McGraw-Hill Education.
- Shaikh, S. A. (2021). Using Fintech in scaling up Islamic microfinance. *Journal of Islamic Accounting and Business Research*, 12(2), 186-203.
- Strzelecki, A. (2023). To use or not to use ChatGPT in higher education? A study of students' acceptance and use of technology. *Interactive learning environments*, 1(2), 1-14.
- Tamilmani, K. & Dwivedi, R. (2021). The extended Unified Theory of Acceptance and Use of Technology (UTAUT2): A systematic literature review and theory evaluation. *International Journal of Information Management*, 57, 102269.
- Torki, L., Rezaei, A., & Razmi, S. F. (2020). The Effects of Internet on the Performance of the Financial Sector in Selected Islamic Countries. *International Journal of New Political Economy*, 1(1), 113-121.
- Uchenna, O. L. & Isibor, A. (2020). Corporate governance and financial sustainability of microfinance institutions in Nigeria. In *Proceedings of the 29th International Business Information Management Association Conference-Education Excellence and Innovation Management through Vision* (pp. 4035-4045).
- Umutoni, J., & Osiemo, K. A. (2023). Efficient Use of Electronic Banking and Financial Performance of Commercial Banks in Rwanda: A Case of Equity Bank Plc. *Journal of Finance and Accounting*, 7(3), 59-79.

- Uwamariya, M., Loebbecke, C., & Cremer, S. (2020). Mobile Banking Impacting the Performance of Microfinance Institutions: A Case Study From Rwanda. *International Journal of Innovation and Technology Management*, 17(01), 2050001.
- Vargo, S. L., Akaka, M. A., & Wieland, H. (2020). Rethinking the process of diffusion in innovation: A service-ecosystems and institutional perspective. *Journal of business research*, 116, 526-534.
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425-478.
- Walliman, N. (2021). *Research methods: The basics* (3rd ed.). New York, NY: Routledge.
- Wangui, M., & Nzuki, D. (2021). The Effect of Electronic Money Transfer Systems on the Financial Performance of Financial Institutions in Kenya (Case Study of Sumac Deposit Taking Microfinance Ltd). *International Research Journal of Business and Strategic Management*, 2(1).
- Wanyonyi, K., & Ngaba, D. (2021). Digital financial services and financial performance of savings and credit cooperative societies in Kakamega County, Kenya. *International Journal of Current Aspects in Finance, Banking and Accounting*, 3(1), 9-20.
- Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal*, 5(2), 171-180.
- World Bank. (2023). *Financial Inclusion and Digital Banking: A Global Perspective on Microfinance Institutions*. World Bank Group.
- World Bank. (2023). *The World Bank estimates that 1.4 billion people worldwide are unbanked*. Retrieved from <https://www.worldbank.org/>



Yusuf, A. I., Oke, O. B., & Ezike, J. E. (2019). E-Payment Technology Channels and Performance of Deposit Money Banks: Evidence from Nigeria. *International Journal of Intelligent Technologies & Applied Statistics*, 12(2), 32-45.

APPENDICES

Appendix I: Data Collection Checklist

Year	Microfinance Bank	Mobile banking	Online lending platforms	Card payment systems	Internet banking	Financial Sustainability		
		Value of mobile transactions	Value of online loans	Value of card transactions	Value of internet transactions	Operating Revenue	Operating Expenses	Operational Self-Sufficiency ratio
2019								
2020								
2021								
2022								
2023								


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