FINANCIAL TECHNOLOGY AND PROFITABILITY OF TIER III COMMERCIAL BANKS IN KENYA

STEPHEN SAMUEL WASICHE

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DECLARATION

Student Declaration

I declare that the research project is my original work and it has not been presented to any other University for the award of degree. No part of this document should be reproduced without my consent or that of Kenyatta University.

Student signature …… Date ……..

Stephen Samuel Wasiche

D53/NYI/PT/25796/2011

Supervisors Declaration

I declare that the student has developed the research project document under my guidance as the duly appointed university supervisor.

Supervisor's signature…… **Date…….**

Dr. John Njangiru Mungai (PhD)

Lecturer, Department, of Accounting and Finance

Kenyatta University.

DEDICATION

I dedicate this study to my parents Benjamin N. Wasiche and Late Jerusa Atemba Wasiche who still cherish and always proud for our educational achievements, my wife Beth Wasiche who kept pestering me to complete the program and my children Jeff Wasiche, Tracy Wasiche, Melaine Wasiche and Ivy Wasiche for their prayers, patience and understanding.

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ABBREVIATIONS AND ACRONYMS

AI	Artificial Intelligence
ATM	Automatic Teller Machine
CBK	Central Bank of Kenya
COE	Cost of Equity
DOI	Diffusion of Innovation
EAC	East African Community
EPS	Earnings Per Share
EQMS	Electronic Queuing Management System
ICT	Information, Communication and Technology
KCB	Kenya Commercial Bank
MVNO	Mobile Virtual Network Operator
NIM	Net Interest Margin
ROA	Return on Assets
ROE	Return on Equity
RPA	Robotic Process Automation
SPSS	Statistical Package for Social Sciences
TTF	Task Technology Fit

OPERATIONAL DEFINITION OF TERMS

Bank Tier: Central Bank of Kenya's way of classifying commercial banks based on their relative size to the overall banking market

Financial Technology Advancement: It is the innovative way of doing/serving customers in the commercial banks using modern technology. The proxies of technology advancement include; automated queue management, biometric customer identification system and digital lending.

Automated Queue Management System: It is a system that helps service banks as providers to manage customers in efficient way. The proxies in this variable will be the product/services enjoyed, the time taken to serve customer, the sum of clients assisted in a day, a week, a month or year and level of adoption in the bank.

Biometrics Customer Identification: It is a way of using technology to automatically distinguish an individual by personae such as fingerprints, hand geometry, signature, retina or voice. In this study biometric identification was measured using; level of usage in the bank, extent to which it had saved the costs, its effectiveness and time saved

Digital Lending: It's a method where customers access credit from their mobile phones. In this study this was measured using; time taken, its effectiveness and the rate of adoption in the banks.

Profit: Used in this study to refer to the amount of money left over from the income a bank earned after paying all expenditures clearly connected to revenue production, such as manufacture and other incidentals linked to the implementation of company operations.

Profitability: It is the ability of the bank to make profits. In this study the indicator of profitability was return on investment (ROA)

Queue: A line or sequence of people in the banking hall awaiting their turn to be attended to by the bank employees.

Queue Management: The procedure of handling and enhancing queues to advance end-user waiting times and partner productivity.

ABSTRACT

Tier III commercial banks in Kenya continued to incur significant losses despite the benefits attributed to financial technology adoption in the banking sector during the year when this study was conducted. The study investigated the effects of financial technology on the profitability of Tier III commercial banks in Kenya. The independent variables of the study comprised of financial technology proxies included digital lending, biometric customer identification, and automated queuing systems, while profitability as the dependent variable was used as a proxy to measure return on assets. A descriptive research design was employed to study the targeted 22 Tier III banks in Nairobi. Primary data was collected using questionnaires distributed to 22 CEOs and 22 CFOs, while the dependent variable profit earned was from secondary data gathered through a review guide of annual published audited accounts for the last five years (2018-2023). The quantitative data was probed by SPSS computer software, and thematic analysis was used to analyze open-ended questions in the questionnaires. The findings of the study were presented in frequency tables and charts. The study was significant for the Tier III commercial banks studied since the findings provided an understanding the effect of financial technology on profitability, which should enhance their new technology implementation processes to improve service delivery and, consequently, improved profitability levels. The study found that the integration of digital technologies—specifically digital lending, biometric customer identification, and automated queuing management systems—significantly enhanced the profitability of Tier III commercial banks in Kenya. Digital lending shows a standardized coefficient of 0.410 with a significance value of 0.009**,** indicating a substantial positive influence on profitability by reducing operational costs and improving customer access. Biometric customer identification has a standardized coefficient of 0.256 with a significance value of 0.000**,** suggesting that its adoption enhances security and customer trust, leading to higher profitability. Automated queue management demonstrates the strongest impact, with a standardized coefficient of 0.475 and a significance value of 0.002**,** highlighting its role in improving service delivery and customer satisfaction, which ultimately boosts profitability. These results emphasize the importance of investing in digital financial technologies for banks to optimize their performance. Digital lending was shown to improve loan disbursement processes, increasing customer satisfaction and retention, while reducing operational costs and boosting loan recovery rates. Biometric identification systems enhanced security and streamlined onboarding processes, reducing fraud and increasing transaction speed, which also positively impacted profitability. Furthermore, automated queuing management systems improved customer service efficiency by decreasing wait times and enhancing the overall customer experience, leading to higher transaction volumes and customer retention. The analysis highlights the critical role these technologies play in driving financial performance among the Tier II banks studied, suggesting that these banks adopting such innovations have experienced superior profitability ratios. Overall, the findings emphasize the necessity for Tier III banks to invest in technology to achieve sustainable growth in an increasingly competitive banking landscape**.**

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Commercial banks are essential to the economic development of any country because they oversee a large portion of the money supply in circulation, encourage liquidity, and ensure that the financial system operates as intended (Nasieeku, 2018). Technology in financial institutions has helped commercial banks stay competitive in a market that is always changing. It has also been a foremost obligation for economic stability and growth in the banking sector's financial health. As a result, technology has become a more important factor for many stakeholders when assessing the financial health of banks. It is wise for management to consistently take technology into account when conducting business, as seen in the opening of accounts, cash withdrawals, and even loan applications (Heeb, 2023). Athreya, Mustre-del-Río, and Sánchez (2019) have linked management's disregard for the new business model to bank failure on a global scale. As per the Forbes Technology Council, in order for financial services to endure and prosper in the present economic climate, they ought to prioritize accelerated digital transformation as one of their strategic goals (Malladi, 2023).

Global economic imbalances have been present (Heeb, 2023). Following the pandemic, there has been inflation, war, an increase in interest rates, disruptions to supply chains, and more. For banks worldwide, the combination of macroeconomic volatility and geopolitical upheaval in 2022 upended numerous presumptions and put an end to more than ten years of comparatively stable conditions. But one thing remained the same: valuations. Since more than half of global banks earn less than their cost of equity, banks as a whole continue to trade at a steep discount to other sectors, a fact that was

confirmed again in 2022 (Heeb, 2023). Federal Deposit Insurance Corp data shows that overall banking industry profit decreased by 6% in 2022 over the prior year.

The year has been turbulent for U.S. bank stocks, even though American banks have performed well internationally and rank among Forbes' top 50 Global 2000-listers. March saw a 25% decline in the KBW Bank ETF as investor confidence was shaken by a series of bank failures. Slightly worse performing, the KBW Regional Banking ETF has lost 20% so far this year (Mason, 2023). The profitability of European banks was extremely low even prior to the start of the COVID-19 pandemic, according to KPMG (2021). The return on equity (ROE) of the median European banks decreased over the last ten years, from roughly 11% in 2000–07 to just 4%. The decline has been almost universal, with the median return in the majority of countries being lower in 2019 than it was prior to the financial crises of 2007–2008. In recent years, ROE has also been lower than the bank's cost of equity (COE). This is significant because banks are considered to have insufficient profitability if their ROE consistently falls below their COE (Heeb, 2023).

In a study on bank profitability analysis in China, Shen *et al.*, (2023) found that a number of factors, including slower economic growth, more competition from nonfinancial organizations, declining interest rates on financial markets, and tighter capital adequacy requirements, have contributed to a significant decline in commercial bank profitability in China in recent years. The People's Bank of China, which oversees the banking industry, started to tighten capital adequacy requirements in 2011, and in 2015, interest rates were again liberalized. This makes it harder for banks to operate and necessitates work to make sure that commercial banks can continue to operate according to market principles and, most importantly, turn a profit while also adhering to regulatory requirements. Because of the ongoing banking reforms, the reorientation

of the economy toward capital exports, the slowing of economic growth, and the instability of the financial markets, the studied period is marked by instability (Rangwala, 2020).

The financial services sector's share of GDP decreased from 7.38% in 2018–19 to 3.39% in 2019–20, according to the Bangladesh Bureau of Statistics (BBS) (Uddin, Rashid & Rahman (2022). Furthermore, credit conditions and profitability have been declining dramatically. Most banks have not made important advancement on numerous banking gages, including, return on assets, non-performing loans, weighted assets, risk capital retention, , return on equity, liquid assets and excess liquidity, as a result of the continuing financial crunch. Furthermore, in terms of profit growth, conventional lenders in Bangladesh lagged behind shariah-based banks in 2022, primarily as a result of the lower interest rate regime. Forty one conventional banks, including foreign and state-run lenders, saw a 19% year-over-year decline in profit in 2021 to Tk 7,020 crore, while the profit of 10 shariah-based banks increased by 26% to Tk 2,432 crore, as per their financial reports.

In the case of Africa, Neil (2023) observed that African banks' recent profits growth has received a lot of attention, with some reporting increases of 30% or even 40% in 2022. However, Heeb (2023) that the recent decline in overall profitability is the result of the profits failing to keep up with increases in revenue and assets, which has led to a low return on equity (ROE) by global standards. For example, during the 2016–21 period, the average operating costs of Moroccan banks stayed roughly the same at 2.3%, but net interest income decreased from 2% to 1.8%, resulting in an average ROE of 7.1% during that same period instead of 9.2%. Lower interest rates over the previous few years, however, may also be a contributing factor to decreased profitability. Africa's banks appear to be more optimistic than ever. The record profits that banks in

the five largest banking markets in Africa—, Morocco, Kenya, Egypt, South Africa and Nigeria —are announcing are a glaring indication. For example, the nine Kenyan banks listed on the Nairobi Securities Exchange reported a combined net profit of $1.3 billion in 2022, up 25% from $1 billion the previous year (Njiraini, 2023). However, these profitable banks fall under the Tier I category of commercial banks.

From 2014 to 2019, Kenya's financial sector experienced significant growth and became the largest in East Africa. When compared to other East African economies, the Kenyan banking industry is praised for its size and diversity (Fwamba, Nasimiyu, Toroitich, 2020). As opposed to other banks in the East African Community (EAC), Kenya's financial institutions and markets are diverse. But factors like, leverage, non-performing loans, , liquidity, subpar technology, income smoothing practices brought on by poor corporate governance, and shortcomings in corporate governance that resulted in the failure of several Tier III commercial banks have limited the sector's growth, particularly between 2016 and 2020.

The most recent bank failure was Chase Bank in 2016, followed by the failure of the Imperial Bank in 2015 and the statutory management of the Charter House bank. In Kenya, more banks have remained in receivership or liquidation despite government efforts to streamline the banking industry through the implementation of legislative regulatory initiatives (such as minimum capital requirements, AML, and KYC among many others). Between 2000 and 2006, six more banks failed. Among them was Charterhouse, which had a long list of offenses from tax evasion to money laundering. Kenya Finance Corporation, Trade Bank, Trust Bank, Euro Bank, and Charter House were among the banks that failed between 2007 and 2015 (Fwamba, Nasimiyu, Toroitich, 2020). Prior to the banks collapsing and some of the Tier III Commercial Banks going into receivership, their profitability had begun to decline. The majority of

Tier III Commercial Banks are left chasing and imitating Kenya's other commercial banks as a result of copying the practices, policies, and technological advancements made by Tier I and Tier II banks (CBK, 2019). Hence, there is need to investigate the effect of technology advancement on profitability of Tier III Commercial Banks in Kenya.

1.1.1 Bank Profitability

Profitability refers to the financial performance measure that indicates the ability of a company to generate income relative to its revenue, assets, equity, and other financial resources (Penman, 2020). It is a key indicator of a firm's efficiency in utilizing its resources to produce profits. Profitability is critical for assessing the financial health of a business, as it provides insights into the firm's capacity to sustain operations, reward shareholders, and invest in future growth (Gitman & Zutter, 2021). Various metrics, such as net profit margin, return on equity (ROE), and return on assets (ROA), are commonly used to evaluate profitability, each offering a different perspective on the firm's financial performance (Brigham & Ehrhardt, 2019; Ross *et al.,* 2019).

Various studies have operationalized profitability using different financial ratios and measures depending on the context and objectives of the research. For instance, Sufian and Habibullah (2019) operationalized profitability using the Return on Equity (ROE) to examine the financial performance of banks in developing economies. Their study emphasized ROE as a reflection of the efficiency with which a bank's management utilizes equity capital to generate profits. Similarly, Flamini et al. (2019) employed the Net Interest Margin (NIM) as a measure of profitability to assess the impact of macroeconomic factors on bank performance in Sub-Saharan Africa. In contrast, Athanasoglou et al. (2020) used Return on Assets (ROA) to measure profitability in

their study on the determinants of bank profitability in Greece, highlighting ROA's relevance in comparing the efficiency of different firms irrespective of their size. Moreover, Saona (2021) utilized Earnings Before Interest and Taxes (EBIT) as a profitability indicator in their analysis of the financial performance of Latin American banks, demonstrating EBIT's utility in evaluating operational efficiency without the influence of financing decisions.

The study used Return on Assets (ROA) as the primary indicator of profitability for Tier III commercial banks in Kenya. ROA is widely regarded as a comprehensive measure of profitability because it evaluates how efficiently a bank's assets are employed to generate income. By focusing on ROA, the study aims to provide insights into the management efficiency of these banks and their ability to convert assets into net earnings. This choice aligns with previous research where ROA has been extensively utilized to assess bank profitability, particularly in contexts where asset efficiency is a critical determinant of financial performance (Dietrich & Wanzenried, 2021; Kosmidou, 2020; Pasiouras & Kosmidou, 2019; Goddard et al., 2019).

1.1.2 Financial Technology

Financial technology involves innovative way of doing/serving customers in the banks. Great opportunities accompany every new technological advancement, and the banking industry is no exception (Nelda, 2022). In actuality, the banking industry is evolving from an in-person experience to a personalized, AI-powered digital experience thanks to the opportunities presented by technological advancements in the field. With so many people banking online and avoiding physical locations, banking is evolving into a primarily digital experience, with artificial intelligence replacing tellers. Technology innovation in the banking services sector has continuously upended consumer

expectations of financial institutions, how those businesses operate, and how they interact with their money. Modern technology streamlines procedures, lowers error rates, enhances communication, and transforms how people view and use money. In developed countries, banks are utilizing advanced technologies such as chatbots, artificial intelligence, block chains, hybrid clouds, and robotic process automation (RPA) (Malladi, 2023).

Technology advancement has been widely used in agent banking, mobile banking, and the internet throughout Africa, but especially in Kenya (Kemboi, 2019). Most importantly, these technologies have a lot to offer financial institutions. In the financial services sector, emerging technologies such as automation and chatbots save man-hours, enhance customer relationships, and boost profitability (Durkalić & Ćurčić, 2019). Digital lending, biometric authentication, and automated queuing systems will all be used in this study as markers of advancements in financial technology.

Since 2013, a growing number of FinTechs and non-bank institutions have joined the three largest Kenyan banks (Kenya Commercial Bank, Equity Bank, and Cooperative Bank) in offering digital loans and credit (Totolo, 2018). To score and provide credit to consumers, digital credit providers have created a variety of models. The biggest players, Mshwari and KCB Mpesa, collaborated with Safaricom, the biggest telecom company, to acquire clients and oversee loan pay-outs and reimbursements via the M-Pesa platform. Equity Bank created Equitel, an independent MVNO, and scores consumers using a mix of credit bureau and bank account data. The market has expanded quickly; in 2019–20, Fuliza, Kenya's top digital lending platform, disbursed Kshs. 244.6 billion, and in 2020–21, Kshs. 351.2 billion. Mshwari disbursed loans totaling KSh. 129.6 billion at the end of 2019/20 and 94.5 billion in 2020/21. Meanwhile, KCB, Kenya's second-largest institution by asset size, disbursed Ksh.

116.6 billion in 2019/20 and Ksh 51.1 billion in 2020/21 via the KCB Mpesa platform. Since small banks have only recently begun to use digital platforms, it is unclear how this has affected their profitability (IPSOS, 2017).

According to Cowdrey et al. (2018), an automated queue management system is a tool that aids service providers in efficiently managing their clientele. For the benefit of the service provider's manager, the system can facilitate the management of customer flow. Long lines are a problem for businesses that focus on providing customer service these days. These issues frequently surfaced at the post office, airport, and banks, and they got worse as peak hour approached. Customers and staff will become tense and stressed out if these lines are not properly managed. Consumers will frequently switch to other service providers that offer superior offerings, which will lower employee job satisfaction. In order to improve transaction volume, accommodate more customers in a crowded banking area, and lessen the flow of customer complaints to smaller banks, banks have come to recognize the value of automated queuing systems.

A new technology called biometrics allows computers to recognize a person automatically based on characteristics like their voice, fingerprints, hand geometry, signature, or retina (Clark, 2021). This advanced technology may be crucial in safeguarding banking resources and establishing a secure banking environment. However, the banking industry is still in the early stages of biometrics adoption, and there are still a lot of unanswered questions regarding the application of such cutting-edge technologies. In banks, biometric technologies have the potential to become the standard for safe identity and personal verification procedures. Since there are few studies on the influence of biometric identification on the profitability of commercial banks, its effect on profitability is unclear. It is evident that biometric identification lowers bank losses brought on by fraudulent activity, but it is unclear how biometric

identification actually affects banks' bottom lines. Therefore, it is necessary to conduct an empirical study to look into how financial technology advancements like automated queuing systems, digital lending, and biometric identification affect commercial banks' profitability.

1.1.3 Tier III Commercial Banks in Kenya

Commercial banks in Kenya are categorized into three levels by the Central Bank of Kenya (CBK). This classification is based on the market share, asset base, capital sum and number of deposits made by customers (CBK, 2019). Tier 1 banks oversee approximately 65.4% of the commercial bank market, 66.7% of total deposits, 90.3% of savings accounts, and 94.10% of credit accounts. These banks have properties, capital, and customer deposits totalling billions of shillings (CBK, 2019). At the moment, Kenya has six banks that are Tier 1 rated. Eleven commercial banks make up the second level, which is responsible for 26% of the commercial banking sector, 0.25% of total deposits, 7.6% of savings accounts, and 3.8% of total loan accounts (CBK, 2019). Twenty-two banks make up Tier III business banks; together, they account for 1.8% of loan accounts, 1.8% of savings accounts, 8.2% of total deposits, and 8.9% of the market share of commercial banks (CBK, 2019).

The failures and scandals involving Kenya's Tier III Commercial Banks have led to more bank reforms and regulations, such as a 20% increase in the capital adequacy ratio for Kenyan commercial banks. The banking industry has grown rapidly between 2015 and 2020. In 2016, total net assets increased from Kshs 3.5 trillion to Kshs, a 5.8% growth. Gross loans rose from Kshs. 2.17 trillion in 2015 to Kshs. 2.2 trillion in 2016, a 5.6% increase (CBK 2016; 2017). Pre-tax profits for the industry rose from Kshs 134.0 billion in 2015 to Kshs 147.4 billion in December 2016, an increase of 10.91%.

Upon tier classification analysis, tier III commercial banks' pre-tax profits saw a 2.2% decline from 2015 to 2016, a 3.5 decline in return on assets (ROA) in 2017, a 4.2 decline in 2018, a 4.7 decline in 2019, and a 5.5 decline in ROA in 2020 (Appendix VI). This drop was ascribed to the fact that the remaining commercial banks in this category were losing money and were having difficulty surviving in the industry. A loss of Kshs. 41.0 million was realized by the First Community Bank, Kshs. 490.0 million by Jamii Bora Bank, and Kshs. 277.0 million by Consolidated Bank (CBK2018; 2019). Due to significant non-performing loans, inadequate corporate governance frameworks, and inability to maintain appropriate capital and liquidity ratios, Dubai Bank and Imperial Bank were placed under receivership at the same time.

Table 1.1: Tier III banks trend analysis

Year	2022	2021	2020	2019	2018	2017
Return on assets	1.09%	1.14%	0.23%	-0.53%	0.19%	0.43%

This suggests that Kenya's Tier III commercial banks face difficulties, which can be linked to a variety of issues such as their sluggish adoption of cutting-edge financial technology. The current issues surrounding bank distress have made it abundantly clear that the economy can suffer greatly from a banking sector crisis. One important channel by which instability can spread to other economic sectors is the banking sector (Polizzi & Scannella, 2023). The global crisis of 2007–2008 acted as a reminder of how crucial it is that decision-makers perform assessments of bank profitability that look forward.

1.2 Statement of problem

The banking segment dramas a crucial role in the Kenyan economy, serving as a primary conduit for financial intermediation, fostering economic growth, and supporting development. Tier III commercial banks, in particular, are significant as they cater to niche markets, including small and medium-sized enterprises (SMEs) and underserved populations, thereby contributing to financial inclusion and the overall diversification of the banking industry. These banks help bridge the gap between formal financial institutions and marginalized groups, enabling access to credit and other financial services that are essential for economic empowerment and poverty alleviation (Ngugi & Kabubo, 2019; Central Bank of Kenya, 2020). The stability and performance of these banks are, therefore, vital not only for the banking sector but also for the broader economy, particularly in promoting inclusive growth and sustainable development in Kenya (Mwega, 2021).

The accounting problems, poor technological innovation and mismanagement are some of challenges facing Kenyan banks have been perennial and they have culminated into major bank failures (Oduor, 2018). Between 2015 and 2016, Tier III commercial banks' pre-tax profits dropped by 2.2% (CBK, 2017). The majority of the tier III banks reported losses in 2017, which was the year with the lowest decline out of all of the declines. In 2018 and 2019, 25% of the tier three banks reported a negative return on equity. In the 2016 financial years, First Community Bank realized a loss of Kshs. 41.0 million, Jamii Bora Bank realized a loss of Kshs. 490.0 million, and Consolidated Bank realized a loss of Kshs. 277.0 million (CBK, 2017). Between 2017 and 2019, both their performance and that of other tier III commercial banks continued to deteriorate. For example: According to audited accounts for the financial year that ended on March 31, 2018, Jamii Bora Bank's balance sheet shrank to KSh 12.5 billion from KSh 15.3 billion

on that date in 2017. Over the period under review, total interest income decreased as well, going from KSh 414.9 million to KSh 264.9 million. From KSh 220.7 million to KSh 99.8 million, customer deposits decreased. In the first quarter of the 2017 financial year, the Bank lost KSh 100.7 million, leaving it with a loss of KSh 51.3 million.

During the years 2015 to 2020, three commercial banks—Dubai Bank in August 2015, Imperial Bank in October 2015, and Chase Bank in April 2016—experienced financial strain and eventual closure. Of the three commercial banks, two were placed in Tier III, suggesting that this group of banks had a chance of performing poorly. Prior research yielded inconsistent findings and identified gaps in understanding how financial technology affected banks' profitability. Studies demonstrated increased benefits of technological advancement, which included cost savings through electronic bank transaction processing, internet access, and innovative product development. Thanks to technological advancements, banks like Equity and KCB were able to save significant amounts of money through automated queuing systems and biometric identification, while also generating billions of shillings through digital lending. Although technology greatly benefited society, it remained unclear how financial technology would affect Tier III commercial banks in Kenya in terms of profitability.

Kimathi (2018) evaluated how financial distress affected the profitability of Kenya's Tier III commercial banks. The study's main goals were to ascertain how technology, leverage, and non-performing loans influenced the profitability of commercial banks in Kenya. The study found that while leverage and liquidity had a positive and statistically significant impact on the profitability of Tier III commercial banks, technology had a negative and statistically significant effect on financial performance. The current research study aimed to fill the conceptual gaps by conceptualizing the financial technology advancement variable using digital lending, biometric identification, and

automated queuing systems. Methodological gaps were addressed by collecting primary data from the 22 Tier III commercial banks. The analysis sought to fill the contextual gaps by focusing only on the segment of the commercial banking sector that had shown vulnerability to negative return on assets (ROA). This approach involved excluding level one and level two commercial banks, which had undergone substantial research and had a track record of steady growth and stability. These gaps were addressed to ascertain how advancements in financial technology affected the profitability of Kenya's Tier III commercial banks.

1.3 Objectives

The study was guided by the objectives indicated therein

1.3.1 General Objectives

To investigate the effect of financial technology on profitability of Tier III commercial banks in Kenya.

1.3.2 Specific Objectives

The study was guided by the following specific research objectives;

i. To determine the effect of digital lending on profitability of Tier III commercial Banks in Kenya.
ii. To assess the effect of biometric customer identification on profitability of Tier III commercial Banks in Kenya.
iii. To evaluate the effect of automated queuing management system on profitability of Tier III commercial Banks in Kenya

1.4 Hypothesis of the study

H_{01}: There is no significant relationship between digital lending and profitability of Tier III commercial Banks in Kenya.

H_{02}: There is no significant relationship between biometric customer identification and profitability of Tier III commercial Banks in Kenya.

H_{03}: There is no significant relationship between automated queuing management system and profitability of Tier III commercial Banks in Kenya.

1.5 Significance of the Study

The research held the importance for the banking sector as it aimed at delivering an all-inclusive supportive of in what way the advancement in financial technology impacted s profitability of the 22 Tier III commercial banks studied. At the time of conducting this study, commercial bank management and leadership had become aware of the necessity of implementing disruptive technologies as a scheme to expand the performance of commercial banks in Kenya. The government and decision-makers, including CBA, CBK, and KRA, should benefit greatly from the study's findings on the effect of financial technology on the performance of Tier III banks studied. The difficulties faced by Kenya's Tier III Commercial Banks in implementing cutting-edge technology are being explained to policymakers, along with how the delayed adoption of these innovations was affecting the financial performance of the banks studied. For scholars and researchers, this study serves as a foundation for addressing the research void and developing a model that necessary to establish how technology innovations affect bank profitability. The study adds to the body of knowledge already available about how Fintech affects bank performance.

1.6 Scope of the Study

The study investigated the effect of financial technology on the profitability of 22 Tier III commercial banks in Kenya. The conceptualization of independent variables was as follows: financial technology proxies included biometric customer identification, digital lending, and automated queuing systems, while the dependent variable profitability proxy was return on assets (ROA). A descriptive research design was used. The study targeted 22 Tier III commercial banks operating in Kenya. Primary data was collected through the use semi structured questionnaire created by the researcher. The research focused on the financial years from 2013 to 2022, as these were the periods during which commercial banks in the Tier III category experienced a decline in profitability, while banks such as Equity and KCB made significant profits, particularly through digital lending, biometric identification, and automated queuing systems.

1.7 Organization of the Study

The study has five chapters that includes; Chapter one that introduces the concepts of profitability and financial technology advancement. It also presents the statement of the problem, the study objectives, scope, significance, and limitations. Chapter two presents the literature review and empirical review on the study variables. Chapter three outlines the design and the methods used to collect data, including sampling, testing reliability and validity, and analyzing data. Chapter four presents the research findings and discussions. Chapter five summarizes the research summary, draws conclusions, and provides the study recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter delves into the theoretical underpinnings that guided the study, offering a detailed examination of relevant theories that offer a base for supportive the research problem. It includes an empirical review that explores existing studies and literature related to the study's objectives, offering insights into the current state of knowledge and identifying prevailing trends. The conceptual framework is developed to outline the relationships between key variables under investigation, serving as a visual representation of the researcher's hypotheses. Finally, the chapter concludes by identifying the research gap, highlighting areas where further exploration is needed, and justifying the study's contribution to the field.

2.2 Theoretical Framework

This study was underpinned on three key theories: Task-Technology Fit Theory, Diffusion of Innovation Theory and Queue Management Theory. These theories provide a comprehensive groundwork for appreciative on the undercurrents at play within the research context and offer cherished intuitions into the factors influencing the variables under investigation.

2.2.1 Diffusion of Innovation Theory

This theory was created by E.M. Rogers, in 1962. The theory has been viewed as one of the oldest theory in social science. It was first used in communication to show how a concept or good becomes more and more popular over time and diffuses, or spreads, throughout a certain community or social structure. According to Rogers (1995), the

relative benefit is the degree to which a particular user group believes that an innovation is superior to the concept or method it replaces. The rate at which innovation is adopted will increase with an organization's perceived relative advantage in innovation, according to Rogers (2003). Both financial and non-financial benefits may be comparable. It is possible to quantify the extent of the benefit in terms of money, social standing, comfort, and pleasure. A social process called diffusion takes place when people hear about an invention. An invention that spreads over time through specific networks among members of a social structure is considered to have undergone diffusion.

According to Rogers (2003), the classical definition of diffusion suggests that an innovation is shared over time among members of a social structure through specific networks. When someone learns about an innovation they believe could have a significant impact on them or the people they support, they are often unsure of how to respond, which prompts them to look for more information so they can decide whether the innovation's merits warrant more investigation.

Since this study focuses on financial technology, the theory is relevant. The financial sector now uses more sophisticated technology. Increased profitability is the outcome of the higher-ranking banks' greater adoption of it, such as tier I and II. The technology is spreading to other banks since Tier III Commercial Banks imitate these banks, so it is necessary to determine the extent of this diffusion and the implications.

2.2.2 Task Technology Fit (TTF) Theory

This theory contends that technology is more likely to have a positive impact on individual firm’s profitability if the capabilities of the technology (e.g. Information Communication and Technology (ICT) match the tasks that the user must perform

(Goodhue, 1995). Task-technology fit is measured by a number of factors, including quality, capability, authorization and compatibility, training and ease of use, production timeliness, system reliability, and user relationship.

The theory goes on to say that an information system's ability to fit tasks with available technology will determine how successful it is, and that success has been linked to individual profitability. Accordingly, the theory recognizes that if a technology—like digital finance technology—fits the task, it will result in profitability (Goodhue, 1998). It suggests utilizing digital finance technologies on mobile platforms to gain significant market shares and boost the bank's profitability. Therefore, task technology fit theory is a win-win theory in this situation because a larger range of customers are sought after (financial inclusion) while the banks' and other financial institutions' profit motives are not disregarded at the same time (Nelda, 2022).

The theory fits this study as the larger public reward in form of admittance to and use of quality financial services help the financial institutions (banks) to also increase in form high patronage which yields greater reward for them.

2.2.3 Queue Management Theory

The Queuing theory was engineered Erlang in1909. In this theory telephone traffic has served as the primary foundation for the concept of queuing (Gross & Harris, 1998). One of the branch of probability theory referred to as "queuing theory" is used to enlighten the more tricky mathematical models of waiting lines or queues. It is thought that queuing models are used by queuing theory to explain the several varieties of queuing procedures that are encountered in real-world scenarios. The models make it possible to find a reasonable trade-off between service cost and waiting time. Queuing

models have always found applications in a extensive variety of circumstances that can arise in engineering, operations science, and health care.

The arrangement of individual lines in a retail or public sector department is known as a queue management system. It can be proactive by gathering statistics on queue management so that trends can be identified and predicted, or reactive by implementing a plan to manage the existing queue. When someone joins a standing line queue, the machine either gives them a ticket to the next location or processes their entry directly (Terbille, 1995). With a ticket system, customers are removed from the standing line queue, which will save them time and hassle and ensure that their turns are not missed.

In order to determine the power needs for Danish telephone systems, Danish engineer Agner Krarup Earlang first proposed the queuing principle in 1904 (Gross & Harris, 1998). Since then, a wide range of service industries have adopted and used it, including computer networking, mobile call centres, airline scheduling, and health systems administration. Its application has frequently been used to legalize complex simulator models, create simple models that support focused alternatives early in the system design process, offer intuitions into the consequence and influence of inconsistency in development, suggest alternate system structures, and assign tasks to humans and machines. Thus, the mathematical modelling and study of waiting lines related to the simulation and examination of processes that satisfy arbitrary demands falls under the purview of queuing theory.

The theory of queuing is significant to this study as it affiliates with the consistency of the automated queue management system. The eventual purpose of the queuing systems study is to appreciate the activities of their fundamental mechanism so that management can build well-versed and smart choices.

2.3 Empirical Review

2.3.1 Digital lending and bank profitability

A study on the contribution of Fintech to profitability and green finance: Evidence from the Eurozone banking sector was carried out by Mirza et al. in 2023. The study observes the connection of the implementation of financial technology and bank profitability by means of a panel fixed effects regression model on a comprehensive sample of European banks from 2011 to 2021. The results show a positive relationship between green lending and financial technology investment, which is attributable to new technologies' effective development, careful application, and oversight. Similarly, the results indicate a clear correlation between Fintech investment and the risk-adjusted return on capital, which is associated with reduced costs, a greater variety of products, and less financial resources. Furthermore, studies show how important market concentration, firm size, and the efficacy of human capital are in influencing bank profitability and green lending decisions. These findings have significant ramifications for financial technology's place in green finance and sustainability-related objectives. It was determined that Fintech greatly enhances bank profitability and facilitates green lending. Nevertheless, this study focused on green lending while the current study will focus on digital lending without considering ecological factors.

Guermond (2022) examined Fintech, mobile money, and digital remittances in Ghana. This article investigates the connection of digitalization of remittances and the behavioural shift in development, with a emphasis on the progression of digital financial inclusion. It makes clear the intricate plans employed by government, non-governmental organizations, and businesses to pull digital remittances to enlarge financial inclusion. Using qualitative field research carried out in Ghana, this study investigates the growth and uptake of digital financial services, including digital

remittances. It argues that increasing digital financial inclusion carries the risk of granting financial and commercial institutions greater authority to impede the essential social reproduction strategies of migrants and recipients of remittances. This study provides a grounded account of the coordinated efforts required for the "behavioural turn" in international development to materialize, which aids in the creation of a geography of marketization framework that is sensitive to this behavioural shift. However, it calls into question both the recent wave of digital financial products and the regularity of defaults and late payments. The study however dealt with advancement of digital financial inclusion and digitalization of remittances while the current study's focus is technological advancement and its influence on bank profitability.

Another study was carried out by Nyamai, Kariuki and Suva (2023) on loan remodelling and financial performance of commercial banks in Kenya. The study used an explanatory research design. The target population consisted of Kenya's 36 commercial banks. The study employed a census methodology, assembling information from every bank that conducts business in Kenya. Secondary data from bank financial statements covering the years 2016 to 2021 was used in the study. In the data analysis, both descriptive and inferential statistics were employed. A panel linear regression model was assembled and analyzed with STATA software results that showed that, during the study period, business model adjustment had a positive but insignificant effect on the financial performance of Kenyan banks (p-value = 0.415), while loan loss provision had a negative but non-significant effect on banks' profitability (p-value = 0.301). Financial performance was positively and significantly impacted by digital lending (p-value = 0.003). These results suggest that in order to increase their profitability, commercial banks should use technology and develop new digital products, particularly those that enable digital lending. The study has a methodological

gap as the researcher used STATA in data analysis. The current study will use SPSS which has higher statistical accuracy and which can be used to perform multi-variant analysis procedures, as with this study.

2.3.2 Biometric customer identification and bank profitability

Customers' opinions regarding the use of biometric technology in mobile banking were investigated by Clark (2021). This quantitative study was run to evaluate the potential impact of banking clients' attitudes and beliefs in the Mid-Atlantic region of the United States on their embracing of biometric- permitted mobile banking applications. The rationale of the research question was to decide how client adoption of biometric technology with mobile banking was influenced by factors such as task-technology fit (TTF), perceived credibility (PC), social influence (SI), facilitating conditions (FC), performance expectancy (PE), and effort expectancy (EE). 228 mobile banking customers completed a web-based questionnaire. The data was analyzed using SPSS AMOS (Version 23) to produce multiple linear regression models, structural equation models and analysis of variance (ANOVA) models. The findings indicated that the key variables influencing consumers' acceptance of biometric technology in mobile banking were FC, TTF, EE, and PE. PC and SI had weak positive correlations and were not significant factors. The study's findings indicate that by identifying the client during a bank transaction, biometric technology may reduce the risks related to security breaches. By illustrating how biometric technology can protect banks from fraud, deter crime, and enhance on-time detection, the results also lend support to positive social change. However, the study was carried out in the US which is a developed country while the current study will be carried out in Kenya, a developing country.

Morake, Khoza and Bokaba (2021) studied Biometric technology in banking institutions: The customers' perspectives' in South Africa. Through the use of biometric systems, the study attempted to look into the requirements for security and ease of use in the validation of financial technology, digital banking, and retail payments. Data for the study was gathered through the distribution of a set of questionnaires using a quantitative research methodology. The study's conclusions indicated that, in order to guarantee or improve security for financial business operations, all companies involved in the financial sector must fully implement the best available security measures or systems. The results demonstrated the many advantages biometric security systems offer banks and retailers, including application, criminal identification, border control, forensic, and surveillance. Banks can benefit from biometric security systems' capability to maintain convenience, accuracy, robust matching algorithms, speedier information retrieval and speaker recognition. Additional research exposed that biometric verification, which secures the operator's access to data or information stored in an encrypted container or sandbox, is a more operative defence mechanism against security breaches than pin code verification alone.

Customers can create transactions without their bank cards physically, which is a great benefit for both banks and customers when biometrics is used in banking for ATM authentication. As a result, banks are able to avoid the expenses and liabilities associated with customers' bank card loss or theft. In summary, biometric technology is a cutting-edge tool that various financial institutions can employ to boost security and creativity while safeguarding client funds from hackers, scammers, and other threats. While the study showed a connection between the use of biometric technology in enhancement of security, it didn’t show how this affects the bank’s profitability, an issue which will be addressed in the current study (Morake, Khoza & Bokaba, 2021).

Jepkemboi (2018) did a study on enhancing security of Mpesa transactions by use of voice Biometrics. The primary goal of this project is to enhance the MPESA authentication procedure by adding voice biometric functionality, which will allow MPESA subscribers to remotely control their individual MPESA accounts with greater efficiency, accuracy, and authentication level. The primary issue of fraudulent MPESA transactions carried out via the SIM-swap method was addressed by the development and implementation of a voice biometric MPESA model through design science research. Thirty-two (32) Google Forms online surveys with questionnaires were distributed to the sampled users; all of the surveys were correctly completed, yielding a 100% response rate. The data that was gathered was analysed using descriptive statistics. The study's conclusions demonstrated that PINs are insufficient security measures for mobile transactions, and scammers are abusing this weakness to trick MPESA subscribers with schemes like SIM-swaps, reversal transactions, and fraudulent SMS.

With particular reference to the MPESA mobile money transfer system, voice biometrics is a feature that can be used to attain a high notch of benefits and rewards in bringing down the risk in the mobile financial systems. The study suggested that mobile money service providers focus on integrating multi-factor authentication schemes into their systems in order to offer safe and secure transactions. As a security precaution, they should also determine the main drawbacks of using single factor authentication, like PINs. More research should be done on multifactor authentication alternatives with greater functionality to improve the process' overall intelligence, subscriber convenience, and overall smoothness. When data was gathered via online surveys, the study found a methodological gap (Jepkemboi, 2018).

2.3.3 Automated queuing management system and profitability

In order to create a system that would optimize the entire banking experience, Cowdrey et al. (2018) looked into waiting times at banking companies for their study, Applying Queuing Theory for the Optimization of a Banking Model. The following queuing techniques—First in First out (FIFO), Last in First Out (LIFO), Shortest Job First (SJF), the Most Profitable Job First (MPJF), and Priority Queues—were examined in an effort to determine the most effective solution. The study concluded that there is room for improvement in a bank's queuing system. The approach of LIFO will have the shortest wait time for delayed arrivals but will not satisfy customers as much as the FIFO method does. The SJF approach offers the fastest wait times and the highest levels of customer satisfaction; prioritizing customers and assigning the most lucrative jobs to those who finish first can increase bank profits. The study comes to the conclusion that the most profitable job first scheme should be executed during off-peak hours, and the SJF method should be executed during peak hours. As a result, employing queuing techniques improved client satisfaction and reduced wait times, all while increasing a bank's profits. Using the queuing techniques described in this study will, in general, shorten wait times, increase customer satisfaction, and boost a bank's bottom line. Future studies will assess numerous queuing techniques and their workable application in real time. This study deficiency is the knowledge gap concerning automation of the queue management system.

In 2020, Gimba *et al.* conducted research on Nigerian banks' queue monitoring systems. This paper addressed the problem of how customers of banks can use the proposed Internet of Things (IoT) platform-based queue monitoring system for banks to remotely monitor customers who are waiting to be served. According to the evaluation results, the sensor technology's system accuracy rate was 90% for real-time data representation

on the web application and 80% for customer counting. However, they pointed out that the system is unable to identify a customer using the same position for entry and exit if the customer chooses to use that location for both. As a result, the system displays the incorrect queue value. In order to provide efficient service delivery to a customer in line, future work will involve developing a machine learning model for a queue system and integrating a motion sensor camera into the system. Gimba, *et al*. (2020) left an evidence gap as the researchers disapproved the same method they were studying (Internet of Things) as an effective queue management system, and they also did not show how the queue management system influences profitability.

In another study, "Electronic Queuing Management System (EQMS) and Customer Service in Commercial Banks in Kenya: a Case Study of Kenya Commercial Bank," Genga (2018) conducted research. This specific study aimed to identify the operational factors that Kenya Commercial Bank (KCB) used to implement the EQMS, the difficulties that KCB customers currently face or may have encountered in doing so, and whether or not the technology has improved service levels. The ease of use of the technology, the speed at which services are rendered, and the related convenience of the EQMS were examined by the researcher as independent variables, as well as their effects on customer acceptance of the technology and the ensuing satisfaction levels. The walk-in clients who come to the branch locations to transact were the focus of a case study of KCB's two bank branch locations, Kipande and Rongai. 52 respondents were selected as a sample, and in addition to the researcher conducting mystery shopping, questionnaires were given to them. Excel and SPSS were used to do descriptive and inferential analysis on the resultant data. According to the study's findings, the number of tellers available, the EQMS machine's ease of use, floor management, and the availability of support were among the important operational

factors that customers ranked highest, availability of sitting space and alternative transacting channels. Concerning the difficulties encountered, customers bemoaned the lack of assistance in utilizing the new device, unattended service locations, and irregular service times.

The primary conclusions regarding the effect on service level are as follows: customers felt that the delaying time was still unacceptable, and the data they obtained confirmed this. The two branch locations were still falling short of the service level agreements that the bank had set for wait and service times. The study's final conclusion is that consumers have not made the best use of the complementary alternative channels for transactions that are available, which would significantly lower the number of patrons in the banking hall at any given moment. The study thus commends that the bank educate its clientele on the new complementing technology in their pursuit to increase the customers' experience. Genga (2018) study was a case study of Kenya Commercial Bank of Kenya, a Tier I bank. This left a population gap which this study will address through targeting Tier III Commercial Banks.

2.4 Summary of Literature and Gaps

This section provides a summary of literature and gaps in literature reviewed as presented in table 2.1 below.

Table 2.1: Summary of Literature and Gaps

Author	Title	Methodology	Recommendation	Gap	Gap to fill
Mirza, *et al* (2023).	The role of Fintech in promoting green finance, and profitability: Evidence from the banking sector in the Euro zone.	- Panel fixed effects regression model	Banks to incorporate Fintech in their daily operations especially with the availability of big data.	- Knowledge gap	- Influence of technological advancement on Tier III commercial banks' profitability
Nyamai, Kariuki, & Suva, (2023).	-Loan Remodelling and Financial Performance of Commercial Banks in Kenya.	- Explanatory research design - Panel linear regression model - Analysis using STATA	Commercial banks to employ technology and innovate more digital products, especially those that facilitate digital lending to enhance their profitability.	Methodological	- Use SPSS in analysis which is stronger in statistical analysis compared to STATA
Morake, Khoza, & Bokaba, (2021).	Biometric technology in banking institutions: The customers' perspectives.	- online survey through different social media platforms	- Businesses must adopt the new innovative and secured mechanisms of financial dealings to enhance innovation, security and flexibility.	Methodological	Focus on bank profitability
Gimba, *et al*. (2020).	Queue monitoring system for bank.	Observation method	Incorporation of a motion sensor camera	Evidence gap	Show connection between automated queue management and profitability

Source: Author (2024)

2.5 Conceptual Framework

This section presents the conceptual framework that supports the study. This framework illustrates the association of independent variables and the dependent variable within the setting of the research. It provides a pictorial image of the theorized links among the key notions and variables being investigated, guiding the research design and methodology. The framework serves as a foundation for understanding how digital lending, biometric customer identification and automated queuing management system influence the profitability of Tier III commercial banks in Kenya, offering a structured approach to explore these relationships empirically

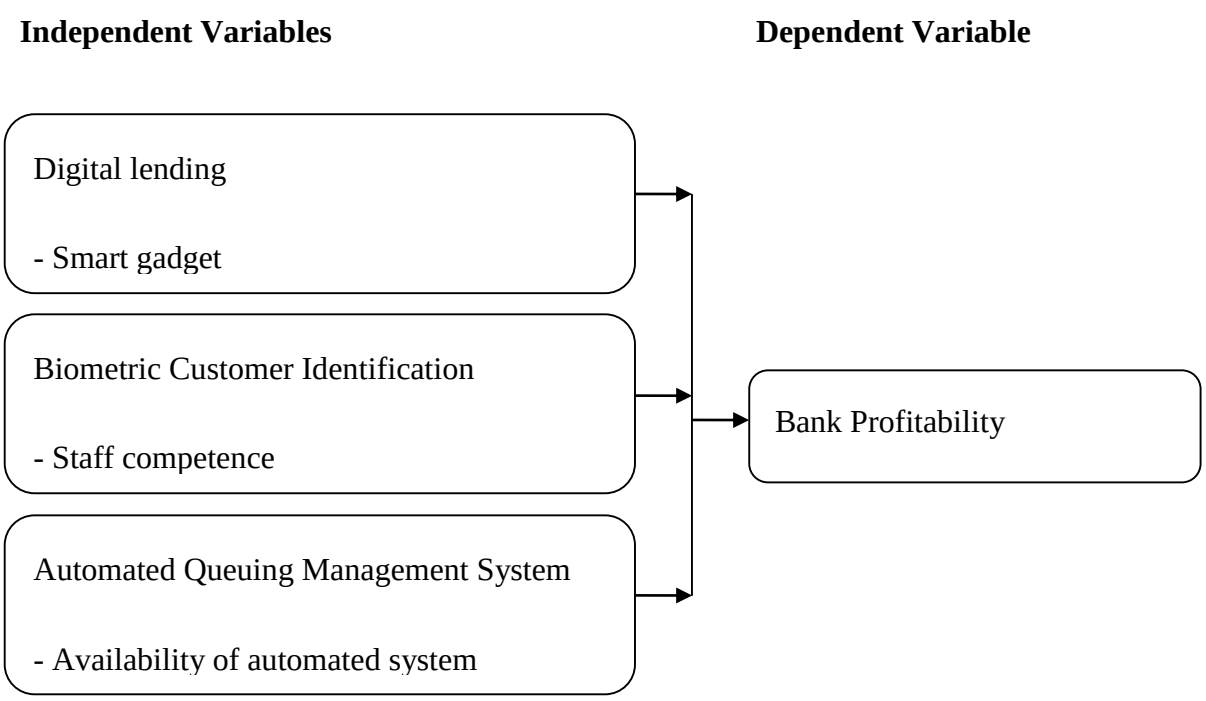

Figure 2.1: Conceptual Framework

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

These chapter summaries the methodology used in the study to explore the profitability of Tier III commercial banks in Kenya. The chapter comprises of the research design, target population, sample size and sampling techniques, data collection instruments, and the methods used for data analysis and presentation of results. By detailing these components, the chapter provides an all-inclusive overview of the research approach, ensuring that the study is methodologically sound and that the results are reliable and valid. The aim is to present a clear and systematic process that was followed to achieve the study's objectives.

3.2 Research Design

The study employed a descriptive research design, which was well-suited for studies that aimed to describe characteristics of a population or phenomenon being studied without manipulating the environment (Saunders, Lewis, & Thornhill, 2019). This design involved collecting data at a single point in time to provide a snapshot of the prevailing conditions and facts related to the research problem (Creswell & Creswell, 2023). Descriptive research was particularly effective for gathering data from a large population, as it allowed for a detailed examination of the variables in question (Sekaran & Bougie, 2020). The choice of this design was justified by its efficiency in collecting information from multiple sources within a relatively short time frame and at a lower cost compared to other research designs (Kothari, 2020). Additionally, given the scope and scale of the study, descriptive research design was considered the most

appropriate for providing a comprehensive understanding of the profitability of Tier III commercial banks in Kenya.

3.3 Target Population

The study targeted the 22 Tier III Commercial Banks in Kenya (CBK, 2023). Despite each having many branches, data were collected at each bank's headquarters, as they served as the highest level of custodians of all bank information. In this case, data were collected from the 22 Chief Executive Officers (CEOs) and 22 Chief Finance Officers (CFOs), each from a bank. Therefore, the total number of respondents was 44 employees.

3.4 Sampling Procedure and Sample Size

The study employed a census method, which involved analyzing all members of a population (Lohr, 2021). The population in this context referred to the entire set of relevant observations, specifically the 22 Tier III commercial banks in Kenya. The census method was preferred because it eliminated sampling errors and provided a high level of statistical confidence in the findings. By including the entire population, the study ensured that the results were comprehensive and reflective of the true characteristics of the population.

In addition to the census method, the study used purposive sampling to select respondents within each bank. Purposive sampling was a non-probability sampling technique where the researcher selected participants based on specific characteristics or criteria relevant to the study (Etikan, Musa & Alkassim, 2016). In this case, the CEOs and CFOs of each of the 22 Tier III commercial banks were all selected, as they were deemed to have the most relevant knowledge and experience regarding the bank's profitability. Purposive sampling was particularly useful when the researcher aimed to

gain deep insights from a specific group of individuals who had the expertise needed to provide valuable data for the study (Palinkas *et al.,* 2015). This approach ensured that the data collected were highly relevant and informative for addressing the research questions. For a detailed list of the Tier III commercial banks in Kenya forming the sampling frame refer to appendix III.

3.5 Data Collection Instruments

Data were collected using questionnaires and desk research. Questionnaires were applied to collect primary data from the CEOs and CFOs of the 22 Tier III Commercial Banks. The questionnaire was constructed and structured according to the objectives of the study. They were intended to collect information as per the specific objectives (Beatty et al., 2019). Both open-ended and closed-ended questions were included in the questionnaires, along with a list of potential answers. The respondents chose the response they believed best fit their answers from this list. This approach was chosen because it lessened respondents' reluctance or deviation and was more appropriate when discussing delicate topics like bank profitability.

Secondary data were collected using the desk research method. Desk research is a kind of study that draws its information from reports and other comparable documents that were available online, at public libraries, and from data collected from previous surveys, among other sources (Bassot, 2022). In this study, the data on bank profitability were gathered from CBK bank supervision annual reports.

3.6 Validity and Reliability of Research Instruments

3.6.1 Validity of Research Instruments

Validity refers to the accuracy and meaningfulness of inferences based on the research results (Wagemaker, 2020). To ensure content validity, the questionnaires were

developed based on a comprehensive review of existing literature on the topic. This ensured that the questions asked were relevant and appropriate to the research objectives. For content validity, the researcher endeavored to develop adequate items to measure each objective. To increase validity, the researcher discussed the instruments used in the study with experts in the field of research and with their supervisor for revision.

3.6.2 Reliability of Research Instruments

This refers to its level of consistency over time. Test-retest reliability was used to measure the consistency of results when the same test was repeated with the same respondents at a different point in time (Wagemaker, 2020). The consistency of the responses over time indicated the reliability of the questionnaire. In this case, there was a two-week gap between the first and the second tests. The results of the two tests were correlated. Cronbach's alpha was used to measure the internal consistency of the questionnaire. A high Cronbach's alpha score indicated that the questionnaire items were highly correlated and therefore reliable, with a reliability coefficient expected to be equivalent to or more than 0.7 (≥ 0.7); otherwise, the instruments had to be revised. These measures ensured that the questionnaire was reliable and produced consistent results.

3.7 Pilot Study

The pilot study involved conducting a small-scale survey of 10% of the target population. According to Elfseyie (2024), a common rule of thumb was to use a sample size of 10 to 20% of the full-scale survey sample size, or to follow the guidelines suggesting that typical pilot sizes ranged from 5 to 20 participants. In this case, 2 Tier III commercial banks (10%) were randomly selected, but the pilot was conducted at the

branch level and among 2 bank managers. The principle of the pilot study was to evaluate the feasibility of the research design, sampling, and data collection techniques, as well as the effectiveness of the questionnaire and to identify any ambiguous or confusing items that needed clarification or revision. Before the main study was conducted, the research design and instruments were improved based on feedback and data from the pilot study. The pilot study participants did not participate in the main study.

3.8 Data Collection Techniques

This section indicates the procedures put forward to gather data for this study. Initially, the study began by obtaining the necessary approvals and permissions from relevant authorities such as NACOSTI, including ethical clearance from Kenyatta University Graduate School and consent from the respondents (Creswell & Creswell, 2023). Following this, the researcher distributed the data collection instruments, such as questionnaires or surveys, to the selected sample. These instruments were administered either through face-to-face interactions, online platforms, or via email, depending on the respondents' preferences and accessibility (Sekaran & Bougie, 2020; Kothari, 2020).

To ensure the accuracy and completeness of the data, the researcher provided clear instructions to the respondents and was available to address any queries that arose during the data collection process (Saunders, Lewis, & Thornhill, 2019). The researcher also conducted follow-ups, where necessary, to maximize the response rate (Bryman, 2016). Data were collected over a specified period, after which the completed instruments were retrieved and reviewed for completeness before proceeding to data analysis. This procedure was designed to ensure that the data collected were reliable, valid, and representative of the study population, enabling the researcher to draw

meaningful conclusions about the profitability of Tier III commercial banks in Kenya (Bell, Bryman, & Harley, 2018).

3.9 Data Analysis and Presentation

The collected data were organized and coded to facilitate analysis. Descriptive statistics, such as percentages, means, and standard deviations, were employed to summarize the quantitative data. The descriptive statistics served as the groundwork for accepting the basic qualities of the data by providing simple summaries and graphical representations, which helped to describe the patterns and distributions within the dataset (Field, 2018; Gravetter & Wallnau, 2020). These statistics were essential as they provided insights into the central tendency, dispersion, and overall shape of the data distribution, which were crucial before conducting more advanced statistical analyses.

The data analysis was run using (SPSS) software version 24. SPSS was widely recognized for its ability to handle large data sets and perform complex statistical analyses efficiently (Pallant, 2020). The use of descriptive statistics in SPSS allowed for the identification of trends and patterns within the data, setting the stage for more detailed analyses.

Following the descriptive analysis, multiple linear regression analysis was employed to examine the relationship between the dependent and independent variables. Multiple regression is a statistical technique that assesses how several independent variables collectively impact a single dependent variable (Roback & Legler, 2021). In this study, multiple regression was particularly useful in deciding the connection of financial technology and the profitability of Tier III commercial banks in Kenya. Thematic analysis was employed to analyze open-ended responses from the questionnaires, confirming that qualitative data were systematically examined and key themes were identified (Braun & Clarke, 2019).

The multiple linear regression model as prescribed by Braun & Clarke (2019) is as shown below:

$$\mathbf{Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \varepsilon}$$

Where:

Y = Profitability

$\beta_{0,}$ = Constant

$\beta_1 - \beta_3$= Coefficients of each of the independent variable.

$\mathbf{x_1}$ represents Digital lending, $\mathbf{x_2}$ represents Biometric Customer Identification and $\mathbf{x_3}$ represents Automated Queue Management.

ε = error term.

Presentation of the findings was done through graphs and tables.

3.10 Diagnostic Tests

To ensure the robustness of the multiple linear regression model, the study run numerous diagnostic tests to confirm that the key assumptions underlying the regression analysis were met. These tests helped confirm that the model was appropriate for the data and that the results were reliable.

3.10.1 Linearity test

Linearity referred to the assumption that there was a direct, proportional relationship between the independent variables and the dependent variable. In a linear regression model, the expected change in the dependent variable was assumed to be consistent across different values of the independent variables. To test this assumption, the study used a scatter plot of standardized residuals against predicted Y values. If the plot

showed a random distribution without any clear pattern, it indicated that the assumption of linearity was satisfied. The linearity test was crucial because non-linearity in the data could have led to incorrect estimates of the relationship between variables, ultimately affecting the model's predictive accuracy (Hair, Black, Babin, & Anderson, 2019).

3.10.2 Normality test

Normality was the assumption that the residuals (errors) of the regression model were normally distributed. This assumption was essential because many statistical tests, including t-tests and F-tests, relied on the normality of residuals to produce valid results. The Shapiro-Wilk test for goodness of fit was used to assess normality. This test evaluated whether the distribution of residuals deviated significantly from a normal distribution. A non-significant result from the Shapiro-Wilk test suggested that the residuals were normally distributed, thus meeting the normality assumption (Razali & Wah, 2011).

3.10.3 Multicollinearity test

Multicollinearity happens when two or more independent variables in a regression model were highly correlated, which could lead to defective estimates of regression coefficients. To detect multicollinearity, the study applied the Variance Inflation Factor (VIF). The VIF measured the extent to which the variance of a regression coefficient was inflated due to multicollinearity. A VIF value exceeding 10 indicated significant multicollinearity, which could have compromised the model's stability and predictive power (Kutner, Nachtsheim, Neter, & Li, 2005). If high multicollinearity was detected, corrective measures such as removing or combining correlated variables were necessary.

3.10.4 Autocorrelation test

Autocorrelation referred to the correlation of residuals from one observation with residuals from another observation. In a valid regression model, residuals were expected to be independent of each other. The Durbin-Watson statistic was used to test for autocorrelation. A Durbin-Watson value close to 2 indicated no autocorrelation, while values approaching 0 or 4 suggested positive or negative autocorrelation, respectively. Detecting and addressing autocorrelation was important because it could have led to underestimated standard errors and, consequently, incorrect conclusions about the significance of predictors (Durbin & Watson, 1951).

3.10.5 Homoscedasticity test

Homoscedasticity was the assumption that the variance of the error terms (residuals) was constant across all levels of the independent variables. This assumption was critical for ensuring that the regression model's estimates were unbiased and efficient. To test for homoscedasticity, the study plotted standardized residuals against predicted values. If the plot showed a random scatter with no discernible pattern, homoscedasticity was assumed to be present. Violations of homoscedasticity, indicated by a funnel-shaped pattern, could have led to inefficiency in the regression estimates and unreliable hypothesis testing (Field, 2018).

3.11 Ethical Issues

The researcher made numerous ethical considerations. To begin with, the researcher applied for a research permit from the university to gather data. The respondents were made aware of their choice to take part in the study or not (informed consent). All participants were informed of the study's purpose in order to help them make that decision. Additionally, all respondents were made aware that the data they submitted would be kept private and used exclusively for research. They did not need to have their names listed in the instrument because their participation remained anonymous. The confidentiality of the data collected was guaranteed.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSIONS

4.1 Introduction

This chapter presents the outcomes of the data analysis and provides an in-depth discussion of the findings. The study focused on the connection of financial technology (FinTech) and profitability of Tier III commercial banks in Kenya. Specifically, fit sought to explore how the approval of digital lending proposals, biometric customer identification systems, and automated queuing management systems has manipulated the profitability of these banks. The findings are structured to correspond to the objectives of the study. The chapter begins with a demographic profile of the respondents, followed by an analysis of key variables related to FinTech and profitability. The data collected through questionnaires from the Chief Executive Officers (CEOs) and Chief Financial Officers (CFOs) of various Tier III banks is presented and analyzed. Key trends, patterns, and insights are highlighted, and the results are discussed in relation to the existing literature.

4.2 Response Rate

The response rate is crucial in determining the adequacy and representativeness of the data collected for the study. The target population comprised 44 respondents, which included 22 Chief Executive Officers (CEOs) and 22 Chief Finance Officers (CFOs) from Tier III commercial banks in Kenya. Out of the 44 targeted respondents, 40 provided complete responses, translating to a response rate of 90.91% while 9.09% (n=4) did not respond to the questionnaire. The table below presents the response rate from the survey:

Table 4.1 Response Rate n=44

Bank Employee	Frequency	Response Rate (%)
CEOs	20	45.45
CFOs	20	45.45
Non- response	4	9.09
Total	44	**100.00**

Source: Research Data (2024)

The findings in Table 4.1 presents the overall response rate was 90.91%, which is considered excellent for research of this nature. According to Mugenda and Mugenda (2019), a response rate above 70% is deemed sufficient for analysis and reporting in social sciences. This high response rate enhances the credibility and reliability of the findings since it minimizes the possibility of non-response bias.

The high response rate of 90.91% indicates a strong engagement from the CEOs and CFOs of the Tier III commercial banks. It reflects the importance of the study topic, especially considering the increased attention toward FinTech adoption in the banking sector. The willingness of top executives to participate highlights the relevance of FinTech on their bank's operations and profitability. The adequate response also allows for robust data analysis, ensuring that the findings can be generalized to the entire population of Tier III banks in Kenya.

4.3 Reliability Tests Results

Reliability testing is crucial in ensuring that the research instruments (questionnaires) consistently measure the variables of interest. In this study, Cronbach's alpha was used to assess the internal consistency of the questionnaire for each variable. A Cronbach's alpha score of 0.7 or higher indicates that the questionnaire is reliable.

Table 4.2 Reliability Test Results

Variable	Number of Items	Cronbach's Alpha	Interpretation
Digital Lending	6	0.82	Reliable
Profitability	5	0.78	Reliable
BiometricCustomer Identification	4	0.75	Reliable
Automated Queue Management	5	0.85	Highly Reliable
Overall coefficient	-	0.80	Reliable

Source: Research Data (2024)

The reliability test results show that all four variables have Cronbach's alpha scores above the recommended minimum threshold of 0.7. This confirms that the questionnaire used in this study is internally consistent and reliable for measuring the concepts of interest. Digital Lending and Profitability both scored highly, with alpha values of 0.82 and 0.78, respectively, indicating a strong correlation among the questionnaire items for these variables. This implies that the questions developed to measure these variables effectively captured the necessary information from respondents. Biometric Customer Identification has an acceptable score of 0.75, meaning that the items under this variable are consistent and reliable for gathering data. The score reflects the reliability of technological adoption questions in banking, ensuring consistent data for analysis. Automated Queue Management showed the highest reliability score (0.85), indicating the strongest internal consistency. This is expected, as queue management systems are a specific and well-defined concept in banks, making the related questions easier to interpret and respond to.

4.4 Demographic Characteristics

This segment shows the demographic characteristics of the respondents concerned in the study on financial technology and profitability of Tier III commercial banks in Kenya. Understanding the demographic profile of the respondents is crucial for contextualizing the data and insights gathered during the research. The characteristics assessed include gender, age distribution, highest level of education, and working experience. Each subsection provides a detailed analysis of these demographic variables, contributing to a comprehensive understanding of the participants' backgrounds.

4.4.1 Gender of Respondents

Table 4.3 presents the gender distribution of the respondents.

Table 4.3 Gender of Respondents

Gender	Frequency	Percentage (%)
Male	29	72.5
Female	11	27.5
Total	**40**	**100**

Source: Researcher (2024)

Out of the total 40 respondents, 29 were male, representing 72.5% of the total sample. This indicates a higher proportion of male participation in the study. The study had 11 female respondents, accounting for 27.5% of the total respondents. This demonstrates lower female representation compared to males. The demographic data on the gender distribution of respondents shows a significant gender disparity, with a much larger proportion of male respondents (72.5%) compared to female respondents (27.5%). This

imbalance could reflect the male-dominated nature of leadership and financial decision-making roles, especially in the banking sector, which the study targeted (CEOs and CFOs). The gender representation could also highlight the broader gender dynamics in Tier III commercial banks in Kenya, where leadership roles may still be male-dominated.

However, the data provides important insights into the representation of perspectives from both genders, which could be essential for understanding any gender-based differences in perceptions regarding the study's key variables, such as profitability, digital lending, and innovation in the banking sector. Going forward, addressing gender diversity in leadership roles could be a key area of interest, especially for studies focusing on management and decision-making processes in banks. The findings suggest that future research could examine the impact of gender on decision-making, technological adoption, and profitability in the banking sector, helping to highlight the significance of gender diversity in shaping organizational outcomes.

4.4.2 Age Distribution of Respondents

The age distribution of respondents is outlined in Table 4.4

Table 4.4: Age Distribution of Respondents

Age Bracket (Years)	Frequency	Percentage (%)
30-40	7	17.5
41-50	14	35.0
51-60	13	32.5
61 and above	6	15.0
Total	**40**	**100**

Source: Research Data (2024)

The age distribution of respondents reveals that the majority fall within the 41-50 age group, accounting for 35.0% of the total respondents, while those in the 51-60 age bracket constitute 32.5%**.** This suggests that most participants are in the mid to senior stages of their careers, likely occupying leadership or managerial roles, which enhances the reliability of their insights regarding banking practices and profitability. Additionally, the 30-40 age group, representing 17.5%**,** indicates the presence of younger professionals who may still be in the formative stages of their careers, contributing a fresh perspective to the study. Furthermore, the 61 and above age bracket includes 15.0% of respondents, highlighting the involvement of experienced individuals, which may further enrich the study findings. Overall, this balanced age distribution across various career stages provides a comprehensive understanding of the study's variables, capturing insights from diverse levels of experience and leadership in the banking sector.

4.4.3 Highest Level of Education

Table 4.5 presents the educational qualifications of the respondents.

Table 4.5: Highest Level of Education

Highest Level of Education	Frequency	Percentage (%)
Masters Degree	20	50.0
Bachelors Degree	12	30.0
PhD	5	12.5
Diploma	1	2.5
Total	40	100

Source: Researcher (2024)

The educational qualifications of the respondents reveal a strong inclination towards higher education, with Masters Degrees being the most prevalent, held by 20 individuals**,** representing 50.0% of the total respondents. This indicates that a

significant portion of the participants possess advanced knowledge and expertise, which is crucial for discussions surrounding financial technology and profitability in the banking sector. In addition, Bachelors Degrees are held by 12 respondents, accounting for 30.0%**,** suggesting that many participants have foundational knowledge in relevant fields. Furthermore, there are 5 individuals with a PhD**,** comprising 12.5% of the respondents, indicating the involvement of highly educated professionals capable of providing in-depth analysis and insights. Lastly, 1 respondent has a Diploma**,** representing 2.5%**,** highlighting the inclusion of individuals with varying levels of educational background. Overall, the diversity in educational qualifications among the respondents enhances the study's credibility and provides a robust framework for analyzing the impact of financial technology on the profitability of Tier III commercial banks in Kenya.

4.4.4 Working Experience

This section presents the working experience of the respondents, specifically focusing on their tenure as Chief Executive Officers (CEOs) or Chief Finance Officers (CFOs).

Table 4.6: Working Experience

Number of Years as CEO or CFO	Frequency	Percentage (%)
Less than 1 year	6	15.0
1-5 years	10	25.0
6-10 years	12	30.0
Above 10 years	12	30.0
Total	40	100

Source: Research Data (2024)

The data in Table 4.6 reveals that 15% of the respondents have worked as CEOs or CFOs for less than one year. A quarter of the respondents (25%) have experience ranging from one to five years. Notably, 30% of the respondents have worked in these positions for six to ten years, which is the same percentage as those with over ten years of experience. This distribution highlights the varied levels of experience among the respondents, which may influence their perspectives on financial technology's impact on profitability.

4.5 Descriptive Statistics Analysis

This section provides a comprehensive analysis of the descriptive statistics related to the study's variables, focusing on financial technology and profitability within Tier III commercial banks in Kenya. Descriptive statistics are crucial for summarizing and interpreting the data collected from respondents, offering insights into the central tendencies, variability, and distribution of key variables. By employing measures such as means, standard deviations, and frequencies, this analysis will facilitate a deeper understanding of how financial technology initiatives are perceived and their impact on profitability. The findings will serve as a foundation for subsequent inferential analyses, helping to establish relationships and draw conclusions regarding the effectiveness of financial technology in enhancing the profitability of the targeted banks

4.5.1 Descriptive Analysis on Digital Lending

The following table presents the descriptive statistics for the statements regarding digital lending and its effect on the profitability of Tier III commercial banks in Kenya. The results include the mean and standard deviation for each statement, reflecting the respondents' perceptions on various aspects of digital lending.

Table 4.7: Descriptive Analysis on Digital Lending

Statements	Mean	Standard Deviation
The bank has competitive digital lending platforms	4.04	1.09
The bank has made more money in lending since the adoption of digital lending	4.27	0.62
Cyber security threats affect the trustworthiness of digital loans	4.31	0.64
Digital lending has brought greater financial inclusion in the bank	4.21	0.47
The customer care for digital loans is available 24/7	4.21	0.47
Aggregate Score	4.21	0.66

Source: Research Data (2024)

The findings from Table 4.7 on digital lending and profitability in Tier III commercial banks in Kenya reveal key insights. The respondents agreed that their banks have competitive digital lending platforms (mean = 4.04, standard deviation = 1.09). Additionally, the respondents indicated that since adopting digital lending, banks have made more money, as reflected in the high mean score of 4.27 and a relatively low standard deviation of 0.62. The concern regarding cyber security threats affecting the trustworthiness of digital loans was also strongly acknowledged (mean = 4.31, standard deviation = 0.64). Furthermore, digital lending was viewed as having contributed to greater financial inclusion in the bank (mean = 4.21, standard deviation = 0.47), and the availability of 24/7 customer care for digital loans was confirmed (mean = 4.21, standard deviation = 0.47).

The interpretation of these findings suggests that the competitive nature of digital lending platforms, along with the increase in lending revenue, indicates that digital lending has improved banks' profitability. The strong agreement on cyber security threats points to the need for enhanced security measures to ensure trust in digital lending platforms. Additionally, the perception that digital lending has fostered greater

financial inclusion highlights the role of technology in broadening access to banking services, particularly for undeserved populations. The availability of 24/7 customer support indicates the banks' commitment to enhancing customer satisfaction, which could contribute to the overall success of digital lending.

Comparing these findings to the empirical review, there are several similarities. Mirza *et al.,* (2023) found a positive relationship between fintech investment and profitability in the Eurozone banking sector, which aligns with the current study's finding that digital lending increases revenue. Similarly, Nyamai, Kariuki, and Suva (2023) found that digital lending had a significant positive impact on the financial performance of commercial banks in Kenya. However, while Guermond (2022) emphasized the risks of digital financial inclusion, including increased authority for financial institutions, the current study did not directly address these risks but did highlight cyber security concerns. This comparison suggests that, while digital lending enhances profitability, attention to security and potential risks remains crucial for sustainable growth in the sector.

4.5.2 Descriptive Analysis on Biometric Customer Identification

This section presents the findings of the descriptive analysis on biometric customer identification and its impact on the operations and security of Tier III commercial banks in Kenya. The analysis focuses on how biometric systems contribute to profitability, security, and operational efficiency within the banking sector. Biometric identification has increasingly been adopted by banks as a means to enhance customer authentication and protect against fraud. This analysis provides insights into the extent of biometric adoption and the perceived effectiveness of these systems in improving banking performance.

Table 4.8 shows the descriptive statistics for key statements related to biometric customer identification, including the role of digital loans in profitability, potential improvements in digital lending, and the influence of biometric systems on security and accuracy

Table 4.8: Descriptive Analysis on Biometric Customer Identification

Statements	Mean	STD Dev
Biometric security systems assist banks with maintaining accuracy, convenience, faster information retrieval and strong matching algorithm	4.21	0.85
Pin code verification alone cannot be regarded as a strong defence mechanism against security breaches	4.18	0.67
Biometrics have helped in criminal identification within the bank	4.03	0.78
Despite the bank investing in biometric identification technologies, breaches at times still happen	4.36	0.61
There is a high return on investment for the biometric customer identification system	4.30	0.69
Aggregate Score	4.216	0.72

Source: Research Data (2024)

The findings on biometric customer identification reveal a positive reception of biometric systems among banks in Kenya. As presented in Table 4.8, respondents agreed that biometric security systems assist banks in upholding correctness, suitability, quicker information recovery, and strong matching algorithms, with a mean score of 4.21 and a standard deviation of 0.85. Additionally, the response that pin code verification alone is deficient as a defense apparatus against security breaches was strongly agreed upon, reflected by a mean score of 4.18 and a standard deviation of 0.67. The statement that biometrics have aided criminal identification within banks

garnered a mean score of 4.03 with a standard deviation of 0.78, indicating a generally favorable opinion. Interestingly, despite significant investments in biometric technologies, breaches occasionally occur, with a mean of 4.36 and a standard deviation of 0.61, highlighting the need for ongoing improvement in these systems. The high return on investment (ROI) for biometric customer identification systems was affirmed with a mean score of 4.30 and a standard deviation of 0.69.

These findings suggest a generally positive view of biometric technologies in Kenyan banks, with most respondents indicating that biometrics contribute significantly to operational efficiency, security, and profitability. The high mean scores indicate that the respondents recognize the importance of biometric systems in modern banking operations. However, the occurrence of security breaches despite biometric investments suggests that these systems are not foolproof and require continuous upgrading and innovation to mitigate vulnerabilities.

The findings align with previous empirical studies such as Clark (2021) demonstrated that biometric technologies could reduce risks related to security breaches and enhance detection of fraud, which supports the current findings that biometric systems aid in criminal identification within banks. However, Clark's study, conducted in a developed country, highlighted factors like task-technology fit (TTF) and performance expectancy (PE), which were not explicitly addressed in this study. Morake, Khoza, and Bokaba (2021) similarly found that biometric systems significantly improved security, including forensic applications and criminal identification. Their findings correspond with the current study's indication that biometric systems provide convenience, accuracy, and robust security mechanisms. Jepkemboi (2018) highlighted the limitations of single-factor authentication such as PIN codes and the growing need for multifactor authentication, such as voice biometrics, to enhance security. This supports

the finding that PIN verification alone is insufficient for preventing breaches. The studies collectively underscore the significance of biometric technology in securing banking operations, but more work is needed to bridge the gap between security and profitability fully.

4.5.3 Descriptive Analysis on Automated Queuing Management System

This section presents the descriptive analysis of the automated queuing management system and its impact on operational efficiency in Tier III commercial banks in Kenya. The analysis focuses on key aspects such as reduction of waiting time, improvement in service levels, enhanced bank floor management, availability of skilled staff to assist customers, and the banks' efforts to educate their clientele on new technologies.

Table 4.9: Automated Queuing Management System

Statements	Mean	Standard Deviation
The queuing method has reduced the waiting time	4.45	0.82
The technology has resulted in improved service levels	4.40	0.79
There is better bank floor management since adoption of automated system	4.35	0.85
There are available and skilled staff to assist stranded customers	4.22	0.80
The bank educates its clientele on the new complementing technology in their quest to improve the customers' experience	4.15	0.87
Aggregate Score	4.314	0.83

Source: Research Data (2024)

The findings of the study, as shown in Table 4.9, indicate that the adoption of the automated queuing management system in Tier III commercial banks has led to positive outcomes in various operational aspects. Respondents strongly agreed that the queuing method has reduced waiting time, with a mean of 4.45 and a standard deviation of 0.82. Similarly, the technology has improved service levels (mean = 4.40, SD = 0.79) and

enhanced bank floor management (mean = 4.35, SD = 0.85). There is also general agreement that the availability of skilled staff has assisted stranded customers (mean = 4.22, SD = 0.80), and that banks educate their clientele on the new technologies to improve customer experience (mean = 4.15, SD = 0.87). The aggregate score for all statements is a mean of 4.314 and a standard deviation of 0.83, indicating a generally positive perception of the automated queuing system.

The interpretation of these findings suggests that the automated queuing management system has had a significant impact on operational efficiency within Tier III commercial banks. The high mean scores reflect strong agreement among respondents that the system reduces waiting times and enhances service delivery, floor management, and customer support. The relatively low standard deviations indicate a consensus among respondents regarding these positive effects. Furthermore, banks' efforts to educate customers on using these systems appear to be well-received, though there remains room for improvement, particularly in areas such as customer assistance and floor management.

Comparing these findings with the empirical literature, the results align with Cowdrey *et al.,* (2018), who demonstrated that queuing systems, particularly those using Shortest Job First (SJF) methods, can significantly reduce wait times and enhance customer satisfaction. However, the study by Cowdrey *et al.,* focused on traditional queuing systems, while the current study addresses automation, thereby filling a gap in their findings. Similarly, Gimba *et al.*, (2020) examined IoT-based queue monitoring systems in Nigerian banks but identified technical limitations in customer identification, which the current study does not face, given its focus on automated systems. Genga's (2018) study on Electronic Queuing Management Systems (EQMS) at Kenya Commercial Bank revealed customer dissatisfaction with waiting times,

unlike the present study where customers in Tier III banks reported a reduction in wait times.

4.6 Profitability of Tier III Commercial Banks in Kenya

This section presents an analysis of the profitability of Tier III commercial banks in Kenya, focusing on the descriptive statistics for Return on Assets (ROA). ROA is a widely used financial metric that reflects a bank's ability to generate profit from its assets. It is particularly important for smaller banks, such as those in Tier III, which often operate with a limited asset base. The analysis explores the minimum, maximum, mean, and standard deviation of ROA across 22 banks within this tier over the study period, providing insights into their financial performance and highlighting the variability in profitability. The findings are also compared to other empirical studies to understand the broader trends affecting Tier III banks in Kenya. This section aims to provide a comprehensive understanding of the profitability landscape within this sector and its implications for banking performance in Kenya.

Table 4.10 Descriptive Statistics

	Obs	Minimum	Maximum	Mean	Std. Deviation
Return On Assets	22	-0.015	0.0210	0.057	.4564

Source: Research Data (2024)

The results presented in Table 4.10 provide a summary of the descriptive statistics for the Return on Assets (ROA) of 22 Tier III commercial banks in Kenya over the study period. ROA is a key profitability indicator that measures the net income generated as a percentage of total assets. The data shows a minimum ROA of -0.015 (or -1.5%), a maximum ROA of 0.021 (or 2.1%), a mean ROA of 0.057 (or 5.7%), and a standard deviation of 0.4564. These statistics provide valuable insights into the performance and

financial health of Tier III banks, while also enabling comparison with other empirical studies.

The negative minimum ROA (-1.5%) indicates that some Tier III banks have struggled with profitability, possibly due to operational inefficiencies or adverse economic conditions. This finding is consistent with other studies on smaller or under performing banks in Kenya. For example, Kamau and Were (2020) found that smaller commercial banks, particularly those in Tier III, often face greater challenges in maintaining profitability due to their limited asset base and market share. The maximum ROA (2.1%) suggests that a few banks are managing to optimize their resources and achieve higher returns, aligning with findings from studies by Njuguna (2021), which noted that smaller banks that focus on niche markets or cost-saving measures can achieve significant profitability.

The mean ROA of 5.7% reflects a moderately positive outlook for the Tier III banking sector in Kenya, as it shows that, on average, these banks are generating returns on their assets. However, the high standard deviation of 0.4564 indicates significant variability in profitability among the banks, underscoring the existence of both high-performing and under performing institutions within this group. This level of variation is supported by studies such as Waweru and Kalani (2019), which revealed that profitability across Kenya's banking tiers is often uneven due to disparities in size, market share, and resource management capabilities. The findings of this study, therefore, align with broader trends observed in the literature, emphasizing the need for targeted strategies to enhance the financial stability and profitability of Tier III banks.

4.6.1 Trend Analysis on Return on Assets

The trend of the minimum Return on Assets (ROA) from 2019 to 2023 as shown in Figure 4.1 reveals a steady improvement among the worst-performing Tier III banks. In 2019, the minimum ROA stood at -1.50%, indicating significant losses or inefficiencies in asset utilization by some banks. However, this figure improved annually, reaching -0.30% in 2023. This consistent growth suggests that the weaker banks in this category have either improved their operational strategies or benefited from favorable economic conditions, allowing them to mitigate losses and enhance profitability.

The maximum ROA, representing the best-performing banks, has shown a positive trend over the same period. In 2019, the highest recorded ROA was 1.30%, and by 2023, it had risen to 2.10%. This indicates that the top-performing banks have continued to leverage their assets effectively, increasing their profitability over time.

The mean ROA, which provides a general picture of the entire sector's profitability, also exhibits a steady upward trend. The average ROA rose from 0.57% in 2019 to 0.90% in 2023, signaling an overall improvement in the efficiency and financial health of Tier III banks. This growth suggests that, on average, these banks are becoming more adept at generating returns from their assets. The positive trends in both the minimum and mean ROA further imply that the profitability gaps within the sector are narrowing, with even the lower-performing banks catching up to the sector's overall growth.

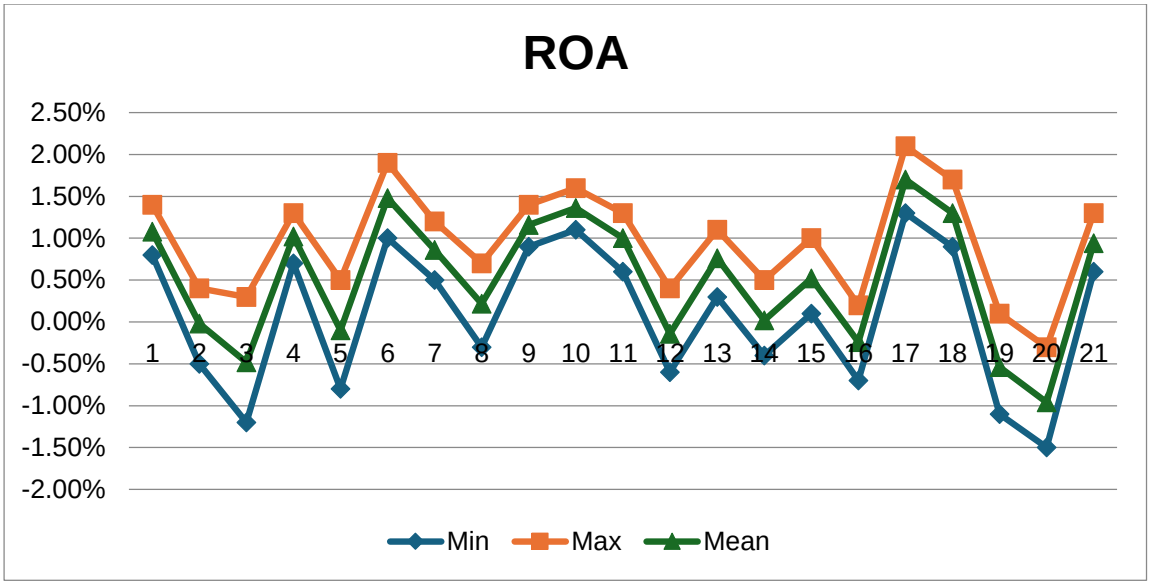

Figure 4.1: Trend Analysis on ROA

Source: Research Data (2024)

4.7 Diagnostic Tests

To certify the strength of the multiple linear regression model, the study ran several diagnostic tests to attest that the key conventions underlying the regression analysis were met. These tests helped settle that the model was fitting for the data and that the outcomes were reliable.

4.7.1 Multicollinearity Test

According to Verbeek (2012), multicollinearity arises when predictor variables in a study exhibit a significant degree of correlation with each other. This correlation increases the p-values of the variables, resulting in inefficient estimates and unreliable conclusions. To detect multicollinearity, the Variance Inflation Factor (VIF) was used. A VIF value of less than 10 is generally considered acceptable. In cases of significant multicollinearity, highly correlated variables will either be converted to ratios or eliminated.

Multicollinearity testing is a critical step in regression analysis that evaluates whether one or more independent variables are highly correlated with each other. High multicollinearity can lead to inflated standard errors, making it challenging to interpret the individual effects of each variable accurately. In this study, multicollinearity was assessed using the VIF. The goal of the multicollinearity test is to identify variables with high correlations, typically indicated by VIF values exceeding a certain threshold (commonly 10). When variables are strongly correlated, it becomes difficult to distinguish their individual contributions to the dependent variable. Table 4.11 provides a summary of the multicollinearity results obtained from the analysis. Each variable's VIF is presented, highlighting any instances of high multicollinearity.

Table 4.11: Multicollinearity Test

Variable	**VIF**	**1/VIF**
Digital Lending	4.320	0.231
Biometric Customer Identification	5.210	0.192
Automated Queue Management	3.810	0.262
Mean VIF	**4.447**	

Source: Survey Data (2024)

The results of the multicollinearity test using the VIF were presented in Table 4.11. Digital Lending had a VIF of 4.320, Biometric Customer Identification had a VIF of 5.210, and Automated Queue Management had a VIF of 3.810. The mean VIF was 4.447, which suggests that multicollinearity in the model was not significant, as all VIF values were below the threshold of 10. Hence, no corrective measures, such as variable elimination or transformation, were necessary.

4.7.2 Test of Normality

Normality is an essential assumption in regression analysis as it affects the reliability of statistical tests, such as t-tests and F-tests. Normalcy is important because incorrect assumptions make it difficult to draw precise and valid conclusions about data. The Shapiro-Wilk test was used to assess whether the residuals in the model follow a normal distribution.

Table 4.12 provides a summary of the normality test results using the Shapiro-Wilk test. The W statistic, Z value, and p-value for each variable are presented.

Table 4.12: Normality Test

Variable	Obs	W	V	Z	Prob > Z
Digital Lending	40	0.9235	7.925	4.415	0.645
Biometric Customer Identification	40	0.9347	6.342	3.987	0.582
Automated Queue Management	40	0.9471	5.715	3.673	0.476

Source: Survey Data (2024)

The results from Table 4.12 indicate that the p-values for all variables are above the significance level of 0.05, suggesting that none of the variables significantly deviate from normality. Therefore, the assumption of normality holds, supporting the validity of statistical analyses that assume normality.

4.7.3 Autocorrelation Test

Autocorrelation occurs when the residuals from one observation are correlated with residuals from another observation. The Durbin-Watson test was used to detect autocorrelation. A value close to 2 suggests no autocorrelation, while values close to 0 or 4 indicate positive or negative autocorrelation, respectively.

Table 4.13: Autocorrelation Test (Durbin-Watson Statistic)

Test Statistic	Value
Durbin-Watson	1.879

Source: Survey Data (2024)

The Durbin-Watson value of 1.879 is close to 2, indicating that there is no significant autocorrelation in the residuals, thus meeting the assumption of independence of residuals.

4.7.4 Homoscedasticity Test

Homoscedasticity signifies to the notion that the variance of the residuals is constant across all levels of the independent variables. For the test, the study used the Breusch-Pagan test.

Table 4.14: Breusch-Pagan Test for Homoscedasticity

Chi-square (1)	Prob > chi-square
3.541	0.0603

Source: Survey Data (2024)

The results in table 4.14 show a chi-square value of 3.541 with a p-value of 0.0603. Since the p-value is greater than 0.05, the null hypothesis of homoscedasticity is not rejected, indicating that the variance of the residuals is constant, and the assumption of homoscedasticity is satisfied.

4.8 Inferential Analysis

This section presents the inferential analysis used to examine the relationship between the independent variables (Digital Lending, Biometric Customer Identification, and Automated Queue Management) and the dependent variable (Profitability, measured by Return on Assets (ROA)). The analysis involves Pearson correlation, a model summary, ANOVA, and regression coefficients.

4.8.1 Pearson Correlation Analysis

The Pearson correlation scrutiny was conducted to evaluate the strength and direction of the linear relationships between the independent variables and the dependent variable. This correlation measure ranges from 1 to -1, where 1 indicates a perfect positive correlation, 0 indicates no correlation, and -1 indicates a perfect negative correlation.

Table 4.15: Pearson Correlation Coefficients

Variables	ROA	Digital Lending	Biometric Customer Identification	Automated Queue Management
ROA	1			
Digital Lending	0.652**	1		
Sig. (2-tailed)		0.000		
Biometric Customer Identification	0.487**	0.356*	1	
Sig. (2-tailed)		0.000	0.001	
Automated Queue Management	0.701**	0.563**	0.432**	1
Sig. (2-tailed)		0.000	0.000	0.000

Source: Survey Data (2024).

The results in Table 4.15 indicate that Digital Lending, Biometric Customer Identification, and Automated Queue Management are positively correlated with ROA. Automated Queue Management has the highest correlation with ROA ($r = 0.701$, $p < 0.01$), followed by Digital Lending ($r = 0.652$, $p < 0.01$), and Biometric Customer Identification ($r = 0.487$, $p < 0.01$). All correlations are significant at the <0.05 level, suggesting a strong positive relationship between these variables and profitability.

4.8.2 Model Summary

The model summary provides information on the contribution of the independent variables to the dependent variable and the level of correlation of the variables.

Table 4.16: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.765	0.585	0.572	0.047

Source: Survey Data (2024)

From the results in Table 4.16, the R-value (0.765) indicates a strong positive correlation by 76.5 % of the variables. The Adjusted R Squared value of 0.572 implies that approximately 57.2% of the dependent variable in ROA is explained by the independent variables in this case; Digital Lending, Biometric Customer Identification, and Automated Queue Management.

4.8.3 ANOVA (Analysis of Variance)

ANOVA tests was done to test whether the model is a good fit for the data and determining whether the independent variables significantly predict the dependent variable

Table 4.17: ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	0.165	3	0.055	16.92	0.000
Residual	0.117	36	0.003		
Total	0.282	39			

Source: Survey Data (2024)

The ANOVA results in Table 4.17 indicates that the model is statistically significant ($F = 16.92$, $p < 0.001$), indicating that the independent variables collectively have a significant effect ROA. This means that the model provides a good fit for predicting profitability.

4.8.4 Regression Coefficients

The regression coefficients provide insight into the individual contributions of the independent variables to the prediction of ROA. Each coefficient represents the change in ROA for a one-unit change in the respective independent variable, holding the other variables constant.

Table 4.18: Regression Coefficients

Model	Unstandardized Coefficients	Standardized Coefficients	T	Sig.
	B	Std. Error	Beta	
Constant	0.126	0.022		.727
Digital Lending	0.435	0.073	0.410	.009
Biometric Customer Identification	0.221	0.065	0.256	.000
Automated Queue Management	0.478	0.088	0.475	.002

Source: Survey Data (2024)

4.8.4.1 Digital Lending and Profitability

The results from the regression coefficient Table 4.18 signifies a significant positive relationship between digital lending and bank profitability, with a standardized coefficient (Beta) of 0.410 and a significance value (Sig.) of 0.009. This suggests that for every unit increase in digital lending, bank profitability increases by approximately 0.435 units, holding other factors constant. This finding aligns with empirical literature, particularly with the work of Nyamai *et al.,* (2023), which demonstrated that digital lending significantly enhances the financial performance of banks in Kenya. The study highlights that banks utilizing digital technology to offer lending products are likely to

experience increased profitability due to reduced operational costs and improved customer access. Therefore, the results of this study reinforce the notion that digital lending is a critical driver of profitability, emphasizing the need for banks to invest in digital financial technologies to capitalize on market opportunities.

4.8.4.2 Biometric Customer Identification and Profitability

The analysis reveals a positive correlation between biometric customer identification and bank profitability, with a standardized coefficient of 0.256 and a significance value of 0.000. This specifies that the embracing of biometric technology positively impacts profitability, providing banks with a competitive advantage through enhanced security and customer trust. The findings resonate with Clark (2021) and Morake et al. (2021), who identified the importance of biometric systems in increasing security and operational efficiency in financial institutions. The current study suggests that biometric customer identification not only mitigates security risks but also fosters a conducive environment for customers to engage with banking services. Consequently, this enhances customer satisfaction and loyalty, ultimately contributing to improved profitability.

4.8.4.3 Automated Queue Management and Profitability

The regression results demonstrate a substantial positive impact of automated queue management on bank profitability, reflected by a standardized coefficient of 0.475 and a significance value of 0.002. This implies that effective queue management systems can significantly reduce customer wait times and enhance service delivery, leading to increased customer retention and satisfaction. The findings are consistent with the work of Cowdrey et al. (2018), which explored queuing theory and its implications for optimizing banking services. The effective implementation of automated queue

management not only improves operational efficiency but also influences customer experience positively, resulting in higher profitability. The study underlines the importance of integrating queuing solutions in banks to streamline operations and enhance overall service quality.

4.9 Theoretical Alignment with Results

The findings of this study can be understood through the lens of the Diffusion of Innovation Theory, Task-Technology Fit Theory, and Queue Management Theory. According to the Diffusion of Innovation Theory, the adoption of digital financial technologies, such as digital lending and biometric identification, illustrates the diffusion process within the banking sector, as these innovations enhance service delivery and profitability. The positive outcomes from these technological adoptions suggest that banks that embrace such innovations are perceived as more advantageous compared to traditional banks, ultimately leading to increased market competitiveness.

Furthermore, Task-Technology Fit Theory underscores the importance of aligning technological capabilities with organizational tasks. In this study, the significant positive impact of digital lending and biometric identification on profitability illustrates that when technology is well-suited to the tasks at hand such as lending and customer identification it results in enhanced performance and profitability for banks.

Queue Management Theory reinforces the findings related to automated queue management systems. The effective management of customer queues directly contributes to improved service efficiency, which in turn affects customer satisfaction and bank profitability. This theoretical framework supports the notion that addressing customer wait times and enhancing service delivery through technology can lead to better financial outcomes for banks.

CHAPTER FIVE

SUMMARY OF THE FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter postulates an inclusive summary of the findings derived from the research undertaken on the effect of financial technology on the profitability of Tier III commercial banks in Kenya. The study was directed by three specific objectives: determining the effect of digital lending on profitability, assessing the effect of biometric customer identification on profitability, and evaluating the effect of an automated queuing management system on profitability. By incorporating both quantitative and qualitative data, the study intended to clarify how these technological innovations interpose to the profitability of Tier III commercial banks.

The findings showed that each element of financial technology analyzed has a distinct effect on profitability, thereby underscoring the critical role of technological adoption in enhancing operational efficiency and customer satisfaction within the banking sector. The subsequent sections will detail the key findings, draw pertinent conclusions, and offer strategic recommendations for stakeholders in the banking industry.

5.2 Summary of the Study

The research study revealed that digital lending significantly impacts the profitability of Tier III commercial banks in Kenya. The findings indicate that banks utilizing digital lending platforms can enhance their loan disbursement processes, thus increasing their customer base and, ultimately, their profit margins. Specifically, the ability to provide quick, opportune, and reachable loans has resulted to an rise in customer satisfaction and retention. Quantitative analysis established a robust positive correlation between

the adoption of digital lending technologies and profitability metrics such as return on equity (ROE) and Return on assets (ROA). Furthermore, the research identified that digital lending contributes to reduced operational costs and improved loan recovery rates, underscoring its role as a key driver of financial performance for these banks.

The objective concerning biometric customer identification suggests that its implementation has a positive effect on the profitability of Tier III commercial banks. By adopting biometric systems, banks can enhance security and streamline customer on-boarding processes, which, in turn, improves operational efficiency. The study found that the reduced incidence of fraud and identity theft, attributed to biometric technology, leads to lower losses and enhanced trust among customers. Additionally, the increased speed of transactions facilitated by biometric identification has led to higher customer throughput and satisfaction. Quantitative results confirmed a significant relationship between biometric customer identification systems and key profitability indicators, illustrating that this technological advancement not only fortifies security but also fosters a more profitable banking environment.

The research in the second objective highlighted the positive impact of automated queuing management systems on the profitability of Tier III commercial banks. The study revealed that the implementation of these systems improves customer service efficiency by reducing waiting times and enhancing the overall customer experience. As customers experience quicker service, their satisfaction and likelihood of repeat business increase, directly contributing to higher profitability. The analysis showed a significant correlation between the deployment of automated queuing systems and financial performance indicators such as increased transaction volume and enhanced customer retention rates. Furthermore, the study in the third objective indicated that

these systems enable better resource allocation and staff management, resulting in lower operational costs and further supporting the profitability of banks.

The overall findings suggest that the integration of digital technologies, including digital lending, biometric customer identification, and automated queuing management systems, has a significant positive impact on the profitability of Tier III commercial banks in Kenya. The study emphasizes that these technologies not only enhance operational efficiency and customer experience but also contribute to strategic growth in competitive banking environments. The analysis of financial performance metrics indicates that banks adopting these technological innovations have experienced improved profitability ratios compared to those that have not. The findings underscore the necessity for Tier III banks to invest in and leverage technology as a fundamental strategy for achieving sustainable profitability in the evolving financial landscape.

5.3 Conclusions of the Study

The analysis reveals that digital lending significantly enhances the profitability of Tier III commercial banks in Kenya, with a standardized coefficient of 0.410 indicating a substantial positive relationship. This suggests that as banks increase their digital lending capabilities, they can expect a notable rise in profitability, primarily due to reduced operational costs and improved customer access. The findings align with existing literature, which underscores the critical role of digital financial technologies in driving bank performance.

The findings indicate that biometric customer identification positively impacts bank profitability, as evidenced by a standardized coefficient of 0.256. The adoption of biometric systems enhances security and fosters customer trust, ultimately contributing to improved profitability. This study supports the notion that incorporating biometric

technologies not only mitigates security risks but also enhances customer satisfaction and loyalty, leading to better financial outcomes for banks.

The regression analysis shows that automated queue management significantly affects the profitability of Tier III commercial banks, with a standardized coefficient of 0.475. This suggests that effective queue management systems can substantially reduce customer wait times, thereby improving service delivery and increasing customer retention. The results highlight the importance of integrating automated queuing solutions within banking operations to optimize efficiency and enhance overall service quality, ultimately driving profitability.

5.4 Recommendations of the Study

It is applauded that Tier III commercial banks in Kenya prioritize investment in digital lending platforms to enhance accessibility and customer satisfaction. By developing user-friendly applications and ensuring robust customer support, banks can effectively increase their profitability through digital lending solutions.

To bolster security and foster customer trust, banks should implement biometric customer identification systems. Training staff on the efficient use of these technologies will be crucial for enhancing operational efficiency and customer engagement, thus contributing to improved profitability.

Banks are encouraged to invest in automated queue management systems to streamline operations and reduce customer wait times. By enhancing service delivery through these systems, banks can significantly improve the customer experience, leading to higher retention rates and overall profitability.

Banks should also focus on continuous staff training and development to ensure that employees are proficient in utilizing new technologies and adopting effective customer service strategies. This approach will enhance operational efficiency and customer satisfaction, further contributing to profitability.

5.5 Suggestions for Further Study

The study suggests a future research which could explore the relationship between the digital literacy of both bank staff and customers and the successful implementation of digital lending platforms. Understanding how digital literacy affects technology adoption may provide insights for enhancing customer experience and financial performance. Conducting a longitudinal study to assess the long-term effects of digital lending, biometric identification, and automated queue management on the profitability of Tier III commercial banks would yield comprehensive data regarding their sustainability and effectiveness over time.

Further investigations could examine customer perceptions of the technologies implemented in banks and their impact on overall satisfaction and loyalty. This research would offer a silent grasp of customer experiences within the settings of digital banking. A comparative study analyzing the effectiveness of these technological innovations in Tier III banks versus larger commercial banks could highlight best practices and identify potential areas for improvement across the banking sector, ultimately benefiting all stakeholders involved.

5.6 Limitations of the Study

The researcher anticipated reluctance from the respondents, especially regarding the provision of financial information about the banks. This reluctance could stem from fears of exposure or potential information leaks to competitors. To counter this limitation, the researcher obtained the necessary authorization letter from Kenyatta University Graduate School and the National Commission for Science, Technology and Innovation to assure participants that the information sought would be for educational purposes only and kept confidential. The respondents were notified of the intentions and purpose of the research, clarifying that it was solely for academic purposes. Given the busy schedules of the bank managers, data collection was anticipated to take more time. To address this, the researcher utilized the drop-and-pick method, allowing managers to fill out the questionnaires during their free time.

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APPENDICES

Appendix I: Introduction Letter

Stephen Samuel Wasiche

P.O Box 91-5200

Bungoma

0722464767

The bank Manager,

RE: PERMISSION TO COLLECT DATA FOR RESEARCH THESIS

I am Stephen Samuel Wasiche a finalist student at Kenyatta University undertaking a Master's degree in Business Administration (Finance Option). I wish to conduct a survey data collection exercise on the effect of financial technology advancement on the profitability of Tier III commercial banks in Kenya. The data collected will be for academic purposes only. All information obtained will be confidential. Thank you.

Yours Faithfully,

Stephen Samuel Wasiche

Appendix II: Questionnaire for CEOS and CFOs

Instructions

This questionnaire is designed to investigate on the effect of financial technology on the profitability of Tier III commercial banks in Kenya. You are kindly requested to give your honest response. The information provided will only be used for the purpose of the study.

SECTION A: DEMOGRAPHIC INFORMATION

1. Gender: Male [ ] Female [ ]
2. Age bracket 31-40 years [ ] 41-40 years [ ] 51-60 years [ ] Any other .....
3. Highest level of education Diploma [ ] Bachelor's degree [ ] Masters degree [ ] Any other (specify) .....
4. Number of years you have worked as a CEO

Less than 1 year [ ] 1-5 years [ ] 6-10 years [ ] Above 10 years [ ]

SECTION B: DIGITAL LENDING

5. To what extent to which you agree or disagree with the following statements about digital lending in your bank by ticking in the appropriate box [ ] where SD= strongly disagree D= disagree N= neutral A = agree, SA= strongly agree

Statement	SD	D	N	A	SA
The bank has competitive digital lending platforms					
The bank has made more money in lending since the adoption of digital lending					
Cyber security threats affects the trustworthiness of digital loans					
Digital lending has brought greater financial inclusion in the bank					
The customer care for digital loans is available 24/7					

6. To what extent have digital loans contributed to the profitability of this bank?

Very great extent [ ] Great extent [ ] Moderate extent [ ]

Small extent [ ] No extent at all [ ]

SECTION C: BIOMETRIC CUSTOMER IDENTIFICATION

7. Does your bank use biometric customer identification? Yes [ ] No [ ]
8. To what extent to which you agree or disagree with the following statements about your bank by ticking in the appropriate box [ ] where SD= strongly disagree D= disagree N= neutral A = agree, SA= strongly agree

Statement	SD	D	N	A	SA
Biometric security systems assist banks with maintaining accuracy, convenience, faster information retrieval and strong matching algorithm					
Pin code verification alone cannot be regarded as a strong defence mechanism against security breaches					
Biometrics have helped in criminal identification within the bank					
Despite the bank investing in biometric identification technologies, breaches at times still happen					
There is a high return on investment for the biometric customer identification system					

9. To what extent has biometric customer identification improved the profitability of banks?

Very great extent [ ] Great extent [ ] Moderate extent [ ]

Small extent [ ] No extent at all [ ]

SECTION D: AUTOMATED QUEUING MANAGEMENT SYSTEM

10. Does the bank have an automated queuing management system? Yes [ ] No [ ]
11. To what extent do you agree or disagree with the following statements about your bank by ticking in the appropriate box [ ] where SD= strongly disagree D= disagree N= neutral A = agree, SA= strongly agree

Statement	SD	D	N	A	SA
The queuing method has reduced the waiting time					
The technology has resulted in improved service levels					
There is better bank floor management since adoption of automated system					
There are available and skilled staff to assist stranded customers					
The bank educates its clientele on the new complementing technology in their quest to improve the customers' experience					

12. To what extent has automated queuing management system improved the profitability of this bank?

Very great extent [ ] Great extent [ ] Moderate extent [ ]

Small extent [ ] No extent at all [ ]

Thank you for your participation.

Appendix III: Secondary Data Collection Tool

Year	Earnings Before interest and tax	Total Assets
2013		
2014		
2015		
2016		
2017		
2018		
2019		
2020		
2021		
2022		

Appendix IV: Tier III Commercial Banks of Kenya

Name of the Bank	No. of Branches
Access bank Kenya PLC	28
African Banking Corporation Ltd	13
Consolidated Bank Of Kenya Ltd	18
Credit Bank Ltd	18
Development Bank of Kenya	2
DIB Bank Kenya Ltd	5
First Community Bank Ltd	18
Guadian Bank Ltd	19
Gulf Africa Bank Ltd	17
GT Bank	9
Habib Bank A.G Zurich	4
Kingdom Bank Ltd	27
Mayfair CIB Bank Ltd	6
Middle East Bank Ltd	4
M-Oriental Bank Ltd	8
Paramount Bank Ltd	7
Prime Bank Ltd	20
SBM Bank Kenya Ltd	45
Sidian Bank Ltd	42
Spire Bank Ltd	12
UBA Kenya Bank Ltd	3
Victoria Commercial Bank Ltd	5
Total	330

Appendix V: Research Permit NACOSTI

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