Perception of Workers on the Impact of Financial Technology on Bank Profitability:

The Case of Commercial Bank of Ethiopia

By: Yared Deneke GSE/0384/13

Thesis submitted in partial fulfillment of the requirements for the degree of Master of Science (M.Sc) in Financial Economics

Advisor: Girma Estiphanos (PhD)

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MSc in Financial Economics

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Examining Committee's Approval

This Thesis has been submitted for examination with my approval as the University examiner/advisor.

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Statement of Declaration

Here, I, Yared Deneke, the student researcher, make a declaration that this research work titled "Perception of Workers on the Impact of Financial Technology on Bank Profitability: The Case of Commercial Bank of Ethiopia'' is my original and genuine work and has not been presented, neither in Addis Ababa University nor any other institution. All references or sources that have been used on this study has either been referenced in the prescribed manner or dually acknowledged.

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Statement of Certification

This is to certify that Yared Deneke has carried out his research work on the topic entitled "Perception of Workers on the Impact of Financial Technology on Bank Profitability: The Case of the Commercial Bank of Ethiopia". The work is original in nature and is suitable for submission for the award of a Master of Science Degree in Financial Economics.

Advisor: Girma Estiphanos (PhD)

Date: _____

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Yared Deneke

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Acronyms

ATM-Automated Teller Machine

BACS-Bank Automated Clearing System

CBE- Commercial Bank of Ethiopia

CHIPS- Clearing House Interbank Payments System

EFT-Electronic Fund Transfer

ECF-Equity Crowd Fund

Fintech- Financial Technology

ICT-Information Communication Technology

IB-Internet Banking

IBM-International Business Machines

MB-Mobile Banking

RTGS-Real Time Gross Settlement

ROA-Return on Asset

SD - Standard Deviation

SPSS- Statistical Package for Social Science

SWIFT- Society of Worldwide Interbank Financial Telecommunications

UNCDF-United Nations Capital Development Fund

USD-United States Dollar

VIF – Variance Inflation Factor

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Abstract

One of the most important strategies banks employ to be profitable and competitive in the banking industry is financial innovation. Using the six financial technology dimensions, this study investigates how financial technology affects bank profitability based on the perceptions of employees at the Commercial Bank of Ethiopia. The impact of fintech on bank profitability was evaluated using the six fintech dimensions, namely ATM, mobile banking, online banking, POS, mobile wallet, and electronic fund transfer. To achieve the research objectives, the study used a descriptive and explanatory research design. To obtain a representative sample from the population, a purposive sampling technique was employed. Using a structured questionnaire, the required data was gathered from Commercial Bank of Ethiopia employees working in branches located in the city of Addis Ababa. A total of 350 out of the 395 questionnaires that were distributed to gather data were returned. Version 26 of the Statistical Package for the Social Sciences (SPSS) was used to process the data. Out of the six financial technologies, four have a positive beta (β) value, indicating a positive association and significant influence on bank profitability. In contrast, two predictors, ATM and POS, insignificantly affect bank profitability, with ATM also having a negative β coefficient, indicating a negative relationship with profitability. Internet banking is the best predictor among all explanatory variables, and it is important to fully utilize it to increase bank profitability.

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Keywords: Financial Technology, ATM, Mobile Banking, Internet Banking, POS, CBE Birr and Electronic Fund Transfer.

Chapter I: Introduction

1.1. Background of the Study

Banks play a critical role in the economic resource allocation of countries. They provide credit services to investors, which they receive from savers in the form of deposits, to enhance investment. Commercial banks act as critical facilitators in achieving sustainable economic growth through efficient monetary intermediation (Levine, 1997).

Commercial banks use advanced information technology to increase their productivity while lowering operational expenses. It encourages the smart and digital transformation of conventional banks while fortifying the bank's risk management. Consequently, banks can increase their profitability and competitiveness by utilizing financial technology. Profit-oriented firms are constantly searching for new and improved products, procedures, and organizational setups that will lower their production costs, better meet consumer needs, and increase their profit margins (Rau and Srivastava, 2021).

The banking and financial industries are entering a new field called financial technology, or Fin-tech. Its main goal is to apply IT-based solutions to improve the efficiency of financial markets and banking operations for customers, banks, companies, and other ecosystem members. Fin-tech refers to a range of financial technology companies that create new products, apps, business models, and procedures for financial institutions as well as for individual users, enabling smoother and better financial services. By implementing various financial technologies, including automated teller machines (ATMs), online and mobile banking, electronic cash transfers, and the growing daily usage of credit cards, banking sectors have enhanced their services (Dongol, 2021).

Because of technological advancements, innovation, and worker transformation, the banking industry is by its very nature dynamic. These factors are driving considerable change in the banking industry, and leaders now have to decide whether to set the standard, accelerate to catch up, or fall behind. To envisage a better future and seize opportunities that foster growth, banks must revolutionize their financial technology, staff and operations. If banks have a clear vision for where they want to go, they can reimagine their future by putting people at the center of their operations, employing new technologies to support them, and encouraging large-scale, rapid innovation.

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Innovation in the financial services sector is explained as advancement and acceptance of better or enhanced financial technologies, markets, institutions, and technology that facilitate trade, information access, and payment methods (Sloan, 2003). According to Nofie (2011), innovation in the banking sector refers to the introduction of new or improved products and processes that reduce the cost of providing already-existing services or transactions. Fintech interact with clients and carry out business via new technology. In actuality, digitalization promotes the use of new technologies to open up fresh doors and revenue streams.

Darolles (2016) defines fintech as the application of numerous cutting-edge technologies in the financial industry. The process of implementing new technology to alter how companies interact with their clients and conduct business is known as digitization. Digitization promotes the use of new technologies to open up new doors and revenue streams.

The word 'fintech,' which combines the words 'finance' and 'technology,' was coined recently in the business world to refer to the disruptive innovation facing the banking sector as it introduces quicker, less expensive, and more customer-centered financial services. In its broadest definition, it is defined as the use of financial innovation to deliver financial products or the use of new technical breakthroughs in financial services and products (Singh, R. et al., 2021).

Globally, fintech has grown rapidly, creating both possibilities and challenges for banks seeking to maximize profits. The emergence of fintech has influenced banks in several ways, including loan relationships, business models, and product design. The ability of commercial banks to serve as intermediaries has been weakened by the fintech industry's explosive growth, which has also given rise to the terms 'shadow banking' and 'financial disintermediation.' However, as fintechs grow, commercial banks are also encouraged to move toward digitalization and intelligence (Allen & Light, 2018).

Fin-tech affects how well banks perform in areas such as clearing and settlement of different bank transactions, ATM payments, mobile banking, Internet banking, and interactive digital banking. One sector that has seen an increase in interest in implementing ongoing innovations created to keep up with the always shifting market is the banking industry. The banking industry has been greatly impacted over the past 20 years by the swift and powerful advancements in information and communication technology (Sujud and Hand Hashem, 2017).

The advent of fintech has significantly influenced the profitability of traditional banks, primarily by altering the competitive landscape and operational dynamics. Fintech companies leverage advanced technologies such as artificial intelligence, blockchain, and big data analytics to offer innovative financial products and services that are often more efficient, cost-effective, and customer-centric compared to those provided by traditional banks. As a result, banks are compelled to adopt similar technologies to remain competitive. This digital transformation can lead to substantial cost savings through automation, improved risk management, and enhanced customer experiences. Moreover, fintech solutions enable banks to access new revenue streams by expanding their range of services and reaching underserved markets. However, the initial investment in fintech integration can be substantial, and the increased competition from fintech firms may pressure banks' profit margins. Overall, while fintech poses challenges, it also presents significant opportunities for banks to enhance their profitability through innovation and improved efficiency (Philippon, 2016).

The State Bank of Ethiopia, established in 1942, marked the inception of the Commercial Bank of Ethiopia (CBE). In 1963, CBE was formally founded as a share company and has since played a significant role in the nation's development. Presently, CBE operates over 1,937 branches and serves more than 37.9 million account holders. Commercial Bank of Ethiopia has been playing a pioneering role in various aspects of banking. CBE pioneered ATM services in the nation, offering greater convenience to customers, and also introduced Western Union Money Transfer services to Ethiopians, facilitating international transactions (CBE Annual Report, 2022/23).

The institution has also embraced digital transformation, as evidenced by the significant increase in active digital channel users. As of the most recent data, there were 10.7 million debit card holders, 8.6 million mobile banking service users, and 10.2 million CBE Birr mobile money service users. This shift towards digital banking is further underscored by the fact that over 771 million transactions, accounting for 65% of the total, were conducted digitally, marking a substantial increase from the previous fiscal year 2022. This shift reflects the institution's commitment to leveraging technology to enhance its performance and provide convenient banking solutions to its customers, ultimately contributing to the socio-economic development of Ethiopia (CBE Annual Report, 2022/23).

The significant shift towards digital channels reflects the increasing adoption of digital banking services in Ethiopia and the bank's efforts to keep up with evolving customer needs. CBE's annual digital transactions reached 3.02 trillion birr, with 2.4 trillion birr in mobile banking, 308 billion birr in ATM transactions, 260 billion birr in internet banking, 19 billion birr in CBE Birr transactions, and nearly 17 billion birr in POS transactions in fiscal year 2022/23. The bank's extensive promotion of digital banking and the public's reduced use of cash notes to prevent COVID-19 spread favored the adoption of digital banking services during that period (The Reporter, July 1, 2023).

1.2. Statement of the Problem

Rapid changes in the competitive landscape, consumer behavior, globalization, regulation, economic shifts, privatization, and other factors need commercial banks to continuously innovate in the financial sector in order to operate successfully and efficiently (Auta, 2010). Financial technology, according to Framework and White (2004), is defined as an activity that lowers a bank's internal costs and risks or that better satisfies client demands and suitable to customers banking need. By allowing payment through mobile banking, online banking, ATM , and money transfers, the banking industry has modernized digital services and eliminated the need for physical branch locations. Prior research has been done by several researchers to examine the effect of financial technologies on the achievement of commercial banks from various angles.

Adoption of e-banking services has the benefit of attracting high value customers, enhanced image, larger customer coverage, improvement of organizational efficiency, and load reduction etc. from the viewpoint of the banks (Mattewos, 2016). The recent study by Jote.GG (2023) and Andinet Asmelash Fentaw et al. (2022), who examined the impact of financial technology on the profitability of commercial banks in Ethiopia, concluded that FinTech has a statistically significant impact on the financial performance of banks.

In Ethiopia, various studies have been conducted on financial innovation and the adoption of E-banking. These include works by Abenet (2010) and Ayana (2012) on E-banking adoption, as well as studies on the challenges and opportunities in adapting E-banking by Gardachew (2010), Abreham (2012), and Kassahun (2016). Others studies have examined the effect of E-banking on the financial performance of commercial banks in Ethiopia, such as the studies by Tilahun (2016) and Solomon (2016). Most of these studies undertaken on the effect of financial

technologies on profitability, such as ATMs, POS systems, mobile banking, and debit cards, consider the volume and value of transactions conducted through these financial technologies.

The rapid adoption of financial technology (fintech) in the banking industry has the potential to significantly impact bank profitability. However, the specific nature of this relationship is not well studied, particularly from the perspective of bank employees who are directly involved in and affected by the implementation of fintech solutions. Hence, this study fills the gap by examining how bank employees perceive the effect of fintech on CBE's profitability. By capturing the insights and experiences of employees, the research seeks to provide empirical evidence on the complex interplay between fintech adoption and bank profitability. The findings could offer valuable guidance to bank management on optimizing fintech strategies to enhance overall profitability.

This study examines the impact of six key financial technology (fintech) dimensions - automated teller machines (ATMs), mobile banking, internet banking, point-of-sale (POS) systems, mobile wallets, and electronic fund transfer - on the profitability of the Commercial Bank of Ethiopia (CBE). The research focuses on CBE as it is the pioneering and dominant player in digital banking within the Ethiopian banking sector, holding the largest market share and assets. By gathering insights directly from CBE employees who are responsible for implementing and managing these fintech capabilities, the study aims to provide valuable guidance to bank management on optimizing their fintech strategies to enhance overall profitability.

1.3. Research Questions

General Research Question

How does financial technology affect Commercial Bank of Ethiopia profitability?

Sub Research Questions

1) How do Automated Teller Machines (ATMs) affect the profitability of CBE?
2) How does Mobile Banking influence the profitability of CBE?
3) How does Internet Banking influence the profitability of CBE?
4) How do Point-of-Sale (POS) systems influence the profitability of CBE?
5) How do Mobile Wallets influence the profitability of CBE?
6) How do Electronic Fund Transfers affect the profitability of CBE?

1.4. Objectives of the study

The general objective of the study

Objective of the study is to assess the perception of workers on impact of financial technologies on Bank profitability.

The Specific Objectives of the study

1) To assess the effect of ATM transaction on bank profitability

2) To assess the influences of Mobile banking transactions on bank profitability

3) To examine the effect of Internet banking transactions on bank profitability

4) To examine the effect of Point of Sales (POS) on bank profitability

5) To assess the influences of Mobile Wallet transactions on bank profitability

6) To assess the influences of Electronic Fund Transfer transactions on bank profitability

1.5. Hypothesis of the Research

A hypothesis test is needed to ascertain the influences of financial technology on the bank profitability of CBE.

H1**:** ATM has a positive and significant effect on profitability of CBE

H2: Mobile banking has a positive and significant effect on profitability of CBE

H3: Internet banking has a positive and significant effect on profitability of CBE

H4: Point of Sales (POS) has a positive and significant effect on profitability of CBE

H5: Mobile Wallet has a positive and significant effect on profitability of CBE

H6**:** Electronic Fund Transfer (EFT) has a positive and significant effect on profitability of CBE

1.6. Significance of the Study

The study is important for evaluating how financial technology affects Commercial Bank of Ethiopia's profitability. The study's findings are important in determining which type of financial technology has the biggest influence on the bank's profitability. It also aid in the development of an integrated financial technology strategy that can increase the bank's profitability and competitiveness in the banking industry.

1.7. Scope of the Study

The scope of the study is limited to all employees of Commercial Banks of Ethiopia who are working at different branches that are located in the city of Addis Ababa. Branch managers,

supervisors, and employees who are directly engaged in digital payment will fill out the questionnaires to get their perceptions about financial technologies and the profitability of CBE. Forms of financial technologies that are considered as independent research variables on this study are Automated Teller Machine (ATM), Mobile Banking (MB), Internet Banking (IB), Point of Sales (POS), Wallet Banking (CBEbirr) and Electronic Fund Transfer (EFT).

1.8. Limitation of the Study

Although commercial bank of Ethiopia has a lot of branches and customers outside Addis Ababa, the research is limited to CBE branches within the city of Addis Ababa. Because of time and budget limitation those of CBE branches outside of Addis Ababa are not be included for this study.

1.9. Organization of the Study

There are five chapters in this research report. The first chapter covers the study's background, problem statement, research questions and objectives, significance, scope, and limitation of the study. The literatures on theoretical frameworks, empirical evidences, conceptual frameworks, and financial technology and bank profitability, as well as operational definitions of terms, make up Chapter 2. The methodology section, which is covered in Chapter 3, addresses data sources, data collection instruments, sample techniques, and data analysis techniques. The study's analysis, interpretation, and findings are presented in Chapter 4. The conclusion and recommendation are finally provided in Chapter 5. The research paper concludes with references and questionnaire attached. .

Chapter II: Related Literature Review

2. Chapter Overview

Under literature review, theoretical and empirical literature related to financial technology and bank profitability is reviewed. The concepts of finance, technology, and fintech are defined and discussed in detail, followed by the evolution of financial technology. Operational research variable definitions and conceptual frameworks will also be parts of the literature review.

2.1. Theoretical Literature

Theories provide a broad justification and explanation for occurrences. The theoretical foundation of financial innovation consists of more existing theories and works of academic scholars. Let us discuss some of theories related to financial innovation and profitability

2.1.1. Theory of Innovation- Schumpeter

Schumpeter (1934) argued that entrepreneurs, including self-employed innovators, possess the ability to enhance the likelihood of future financial profit through their inventions. However, he also envisioned a scenario where, before the economy reaches equilibrium, a new wave of innovations referred to as "Kondratiev cycles" by Schumpeter (1934) emerges, restarting the business cycle. According to Schumpeter (1934), innovations are continually occurring within the business sphere, with new ideas constantly being introduced into the economy. Consequently, institutions, including the financial sector, must remain cognizant of these innovations.

This is why commercial banks embrace and utilize various innovations to enhance their services, customer experience, efficiency, and ultimately profitability. It is this recognition of the constant evolution of innovations that drives the Commercial Bank of Ethiopia to adopt and implement financial innovations to enhance its financial performance. Financial innovations serve as a critical tool for the strategic transformation of commercial banks, enabling them to adapt to changes driven by advancements in science and technology.

It is due to this fact that Commercial Bank of Ethiopia adopts and implements financial innovations in order to boost up its financial performance. Financial innovations allow commercial banks to adapt to changes brought about by scientific and technological advancements, making them a crucial tool for strategic transformation.

Schumpeter (1934) outlined two primary dimensions of innovation: product and service innovations. Product innovations involve the development of new goods or entirely novel products that better fulfill existing or previously satisfied needs. On the other hand, process innovation entails the adoption of new or significantly improved operations or production methods. Schumpeter's insights are further reinforced by Porter et al. (1992), who emphasized the critical importance of innovation in securing a country's competitive advantage and fostering long-term economic growth.

According to this theory, banks can increase their performance, relevance, and competitiveness by strategically choosing financial innovation and hence, service providers like banks have to continuously address the needs of their clients and adapt to the changing needs of society.

2.1.2. Theory of constraint-induced financial innovation

Silber (1983) created theory of constraint-induced financial technology. According to this theoretician, commercial banks operating in highly constrained markets have every incentive to embrace and apply financial innovation that helps them improve their financial performance by lowering transaction costs. This is because adoption of such innovation is primarily driven by the desire to improve the banks' financial position or maximize profits.

Innovations may be restricted by the banking industry's stringent regulations, which are imposed on it (Silber, 1983). These limitations have two effects: they make it harder for banks to adopt new technologies and may also reduce their overall effectiveness. Because of the significant hidden costs associated with impediments like regulations and entry restrictions, businesses confronting them are most motivated to innovate and increase revenues. According to this theory financial innovations have been observed as a tool to boost and enhance financial institutions' earnings or financial position.

Therefore, the idea is significant because it clarifies the motivations behind banks' forays into financial innovations. Furthermore, Ethiopia's commercial banks may not be free to implement any financial innovations without the national bank of Ethiopia's consent due to stringent regulation by the national banks of Ethiopia.

2.1.3. Transaction cost innovation theory

The Transaction Cost Innovation Theory, initially proposed by Hicks & Niehans (1983), highlights the importance of reducing transaction costs as a central aspect of financial

innovation. They argued that advancements in technology have played a crucial role in decreasing transaction costs, leading to innovations in finance. These improvements in financial processes help streamline operations enhance coordination, management, and data utilization, ultimately reducing exchange costs for businesses.

The theory suggests that innovations aimed at reducing transaction costs, such as internet-related Information Technology (IT), can significantly benefit companies. Internet-related IT provides remote access to internal databases and other essential information sources, thus lowering transaction costs. Introducing services like mobile and agency banking further decreases operating costs, consequently boosting a bank's profitability.

In the context of analyzing the factors influencing financial innovations on the financial performance of commercial entities, the Transaction Cost Innovation Theory serves as a valuable framework. It underscores the importance of minimizing transaction costs through innovation, guiding businesses in their pursuit of improved financial performance.

2.1.4. Innovation Diffusion Theory

The spread of innovations idea was developed in 1962 by University of New Mexico communication theorist E.M. Rogers. The theory describes the many stages of adoption that different people go through when they interact with or begin to embrace a new idea. Gardachew (2010) found that the following variables affect how quickly innovations spread: Pros (which explained how technology can improve on the tools that are currently in use); compatibility (which explained how stakeholders' social practices and norms are generally consistent); complexity (which only made use and learning easier); and trialability (which provided opportunities to test innovation before putting it into practice), and observability (which clarified how much of an impact ICT has and how visible it is). The elements mentioned above are not mutually exclusive, so it is impossible to anticipate how much or how quickly innovation will spread.

2.1.5. Kane’s Theory of Regulatory Dialectic

In his work, American economist Kane characterizes the dynamic interplay between regulation and innovation as a "dialectic of management". He likens management and financial institutions to opposing sides of a seesaw, constantly adjusting to each other to establish a balanced

equilibrium. Kane (1984) views innovations as responses to legal regulations that impose constraints on the freedom of financial institutions.

Financial innovation, according to Kane (1984), is an institutional response to financial costs brought on by shifts in market demands, technological advancements, and political influences—particularly laws and regulations. He refers to the interplay as a dialectical process between innovation, institutional avoidance, and regulation.

In particular, the regulatory dialectic between federal banking regulations and exogenous market forces like technological advancements, changes in the banking environment, and growing uncertainty regarding future financial developments is the focus of Kane's model, which focuses on the evolution that was observed in the United States during the 1960s and 1970s.

2.1.6. Financial Innovation

Financial innovation, as defined by various scholars, encompasses the development of new products and services, the realignment of processes within organizations, the establishment of new institutions, the adoption of new technology, and the introduction of new ideas that bring about changes in financial markets. It entails developing brand-new financial services, tools, or goods. These developments are frequently the result of improvements in payment methods, technology, and financial instruments. The advent of digital technology has had a noteworthy impact on the financial services sector, altering the ways in which people save, borrow, invest, and carry out transactions.

Financial innovation is essentially the development and broad use of new financial instruments, technology, organizations, and markets. Analyzing financial innovations has become increasingly important in light of recent shifts in banking activities and the broader financial landscape.

2.1.7 Key Enablers for Financial Innovations

According to the McKinsey & Company report, 'Remaking the Bank for an Ecosystem World' (2018), digitalization enables banks to reach a wider customer base at minimal cost and offer more affordable services. Financial technologies in the banking industry can be facilitated through digital enablers, which primarily include:

Digitalizing Customer Experience: This involves understanding and addressing both stated and unstated needs of existing and potential customers, tailoring business models accordingly.

Customers increasingly expect seamless, multichannel experiences and consistent service. Their experience is often evaluated based on how well companies understand their needs, the simplicity of conducting business, and their preferences (Chaffey and Ellis-Chadwick, 2019).

Digitalizing Products and Services: Historically, banks have prioritized sales targets over understanding customer needs. However, there's a growing emphasis on customer-centricity. Digitalization enables banks to reach billions of customers at minimal cost and offer affordable services. To remain competitive, banks must develop innovative products and services that align with customer needs (Peppers and Rogers, 2016).

Digitalizing Organization: Many banks have focused on digitizing front-end operations, neglecting the impact on back-end processes. To support the digital banking journey, a comprehensive restructuring of existing systems is necessary. This includes adapting internal organization and governance policies to align with a multichannel approach (Lopez, 2020).

Digitalizing Operations: The digital banking landscape thrives on transparency and convenience, engaging customers, competitors, and regulatory agencies. Banks can enhance customer service and identify opportunities by examining the entire customer lifecycle. This involves implementing digital marketing and customer service strategies to improve overall customer experiences (Chaffey and Ellis-Chadwick, 2019).

By leveraging these digital enablers, banks can enhance their technological capabilities, streamline operations, and ultimately improve customer satisfaction and loyalty in an increasingly digital world.

2.1.8 Evolution of Financial Technology

Over the past two decades, the banking industry has undergone significant transformation due to rapid advancements in information and communication technology (ICT). These advancements have reshaped banks' business models, customer interactions, and specialized functions.

The relationship between financial services and information technology is now perceived as legally bound, akin to marriages. However, this relationship has evolved through three distinct eras. The foundation of the fintech industry was laid in the late 20th century with the innovation of electronic banking. Since then, fintech has evolved and expanded, driven by technological and internet advancements. This evolution has led to the creation of new financial services and

products aimed at improving accessibility, simplicity, efficiency, and profitability in the financial services industry (Shanti et al., 2023)

Fintech has had a significantly beneficial impact on the net assets of traditional banks. Strengthening the application of fintech has the potential to substantially increase the profitability of traditional banks. Therefore, it is essential to understand the historical evolution of fintech before assessing its impact on bank profitability (Basdekis et al., 2023).

2.1.8.1 The first age of financial globalization

According to a study by Arner, D.W. et al. (2015), technology and finance came together in the late 19th century to create the first wave of financial globalization, which persisted until the start of World War I. The telegraph, railroads, canals, steamships, and other technologies of the era supported cross-border financial interconnections and enabled the quick transfer of financial data, transactions, and payments. Simultaneously, the financial industry supplied the resources required to advance these technologies. John Maynard Keynes, in his writings from 1920, provided insights into the intertwined relationship between finance and technology during this initial phase of financial globalization. Keynes's work sheds light on the intricate interplay between financial advancements and technological progress that characterized this period.

2.1.8.2 The early post-war period

In the post-war period, technological advancements, particularly stemming from wartime innovations, rapidly progressed, notably in communication and information technology. These advancements included the commercialization of code-breaking tools into early computers by companies like IBM and the introduction of handheld financial calculators by Texas Instruments in 1967. Additionally, the 1950s saw the emergence of credit cards such as Diners' Club, Bank of America, and American Express, which transformed consumer transactions. The establishment of the Interbank Card Association (now MasterCard) in 1966 and the global telex network by the same year provided essential infrastructure for financial communication. The introduction of the fax machine by Xerox Corporation in 1964 further enhanced communication capabilities, while the deployment of the first ATM by Barclays in the UK in 1967 marked a significant milestone in financial automation. Together, these advancements signify the beginning of the FinTech era, characterized by the integration of technology into traditional financial services.

2.1.8.3 Development of Traditional Digital Financial Services (1967-2008)

The era of FinTech commenced with the introduction of the calculator and ATM in 1967, marking a shift from analog to digital within the financial services industry. Between 1967 and 1987, there was a notable transition as financial services increasingly embraced digital technologies. The second wave of financial globalization was prompted by significant events, notably the worldwide response to the US stock market crash of 1987.

In the realm of payments, key developments included the establishment of the US Clearing House Interbank Payments System (CHIPS) in 1970 and the UK's Inter-Computer Bureau in 1968, which later served as the model for Bankers' Automated Clearing Services (BACS). Fedwire, originally established in 1918, transitioned from a telegraph system to an electronic one in the early 1970s. The need for cross-border interconnection led to the founding of the Society of Worldwide Interbank Financial Telecommunications (SWIFT) in 1973.

During this period, financial institutions increasingly relied on IT for internal operations. By the 1980s, computerization had advanced, accompanied by the emergence of risk management technologies, which gradually replaced many paper-based processes. By the late 1980s, fax machines had largely replaced telex as the primary means of communication in the financial sector, facilitating electronic transactions among financial institutions and global market players.

By 1998, financial services had largely transitioned into a digital business. The subsequent phase of expansion was catalyzed by the rise of the Internet, with Wells Fargo pioneering online account checking over the World Wide Web (WWW) in 1995. By 2001, eight US banks had over one million online clients, prompting other countries to develop similar systems and regulatory frameworks to manage associated risks. In the UK, ING Direct and HSBC Direct became the first direct banks to open without physical branches around 2005.

2.1.8.4 Financial technology (2008 – present): Democratizing Digital Financial Services

Certainly, the 2008 Global Financial Crisis acted as a significant catalyst for the development of the fintech era. The crisis exposed weaknesses in traditional financial systems, leading to increased demand for alternative solutions that were more efficient, transparent, and resilient. This paved the way for FinTech startups to disrupt the industry with innovative services and products aimed at addressing the shortcomings of traditional banking.

Moreover, the large-market penetration of smartphones has played a pivotal role in shaping the landscape of FinTech. The mass-spread adoption of smartphones has democratized access to financial services, allowing millions of people around the world to access banking, payments, and investment platforms conveniently from their handheld devices. Smartphones have become the primary gateway to the internet for many individuals, enabling seamless integration of financial services into their daily lives.

In essence, the combination of the 2008 financial crisis and the proliferation of smartphones has accelerated the growth of the FinTech industry, ushering in an era of unprecedented innovation and disruption in traditional finance.

2.1.9 The landscape of financial innovation in Ethiopia's Banks

Fintech presents a unique opportunity for Ethiopia's financial sector as the world undergoes significant digital transformations. With a commitment to creating a Digital Ethiopia by 2025, the establishment of a robust digital payment ecosystem is crucial. However, Ethiopia faces challenges due to the relatively low penetration of digital financial services compared to its neighboring countries in East Africa.

According to the United Nations Capital Development Fund (UNCDF), the low performance of the mobile money ecosystem is a key factor hindering Ethiopia's digital financial services. Despite its potential, Ethiopia lags behind many African countries in terms of digital payment competitiveness, as highlighted in a recent study by the Policy Study Institute and Ethiopian Civil Service University.

The study indicates a significant gap between Ethiopia and countries like Kenya in terms of digital transactions to GDP. In 2019, Ethiopia recorded only 7.4% of digital transactions to GDP, while Kenya reached 43.4% in 2020.

Ethiopia also has a low number of ATMs per capita, with only 5.29 ATMs per 100,000 people in 2021, compared to the Sub-Saharan Africa average of 6.94. Additionally, mobile money transactions in Kenya far surpass those in Ethiopia, with Kenya recording USD 109.9 billion in 2022 compared to Ethiopia's USD 470 million. Similarly, agent transactions in Kenya were significantly higher than in Ethiopia, indicating a disparity in the adoption of financial technology services between the two countries.

These figures underscore the need for Ethiopia to enhance its digital payment infrastructure and promote financial inclusion to bridge the gap and fully leverage the potential of fintech for economic growth and development.

2.1.10 Form of Financial technologies in Commercial Bank of Ethiopia

Different definitions of Financial Technologies are provided by the researchers. Some consider it as a development of new products and services, some consider as improvement in service efficiency , some other consider it as information & technology that eases bank operation and service accessibility

I-Automated teller machine (ATM)

With the use of a specialized computer, an automated teller machine (ATM) enables you to execute financial transactions without going through a bank representative. Numerous ATMs are easily available day or night and can be used for a variety of purposes, including checking account balances, making deposits or withdrawals, and moving funds between accounts.

A form of electronic banking facility called an automated teller machine (ATM) allows customers to do standard transactions without the need of a teller or branch staff. Almost all ATMs, allow users access cash with a credit or debit card.

ATM enable speedy self-service activities including deposits, cash withdrawals, bill payment, and account transfers. Cash withdrawal fees are often assessed by the ATM operator, the bank where the account is kept, or by both. Across the world, ATMs are referred to as cash machines or automated bank machines (ABMs).

While some ATMs are only basic cash dispensers, others can also be used for transfers and deposits. Modern ATMs are amazing pieces of technology; many of them can accept deposits in addition to providing a number of other financial services. Use an ATM branded by your own bank as much as you can to reduce ATM costs.

II-Mobile Banking (MB)

For its clients, banks and other financial institutions can conduct financial transactions remotely through the use of a mobile device, such as a smartphone or tablet. We call this service mobile banking. It uses software, sometimes called an app, provided by the financial institution, as opposed to the related internet banking. Mobile banking is usually available at all times. Some financial organizations place restrictions on the number of transactions that may be made and the

accounts that can be accessed using mobile banking. A data or internet connection must be present on the mobile device in order to use mobile banking.

Transactions via mobile banking can include peer-to-peer payments, electronic bill payments, fund transfers between a customer's and another's accounts, account balance queries, and lists of recent transactions, depending on the capabilities of the given mobile banking software. Customers can also download and occasionally print statement copies from certain apps at home. Mobile banking apps provide security while also enhancing usability, speed, and flexibility because they work with the user's internal mobile device security mechanisms. According to Harelimana (2018), mobile banking has a favorable effect on Unguka Microfinance Bank Ltd.'s financial performance in Rwanda. The bank's revenue grew due to its banking services, which included bill payment, fund transfers between accounts, order books, bank statements, and mobile money. From the perspective of the bank, mobile banking lowers transaction costs by eliminating the need for clients to physically visit a branch to make non-cash withdrawal and deposit requests. Customers who want to make cash withdrawals or deposits must visit an ATM or bank branch as mobile banking is not capable of handling these types of operations.

III-Internet Banking (IB)

Internet banking is the service we provide that allows you to use a personal computer and the Bank's website to access and conduct transactions on a designated account. Furst (et al., 2014) defines Internet banking as a service that banks provide to their clients that allows them to conduct business with the bank online. Through the bank's website, transactions and other information can be obtained by utilizing internet technology. As a result, clients can communicate with the bank online without physically visiting the bank. The customer connects their device to the bank system via a desktop, laptop, tablet, or smartphone that is online.

Internet banking refers to a safe online electronic service provided by the bank that allows customers to establish an online connection and conduct both financial and non-financial transactions with the bank from a distance. Customers of banks and other financial organizations can use internet banking, also known as online banking, e-banking, or virtual banking, to carry out a range of financial operations via the financial institution's website.

IV-Point of Sales (POS)

A point of sale, or POS, is a device used by retail customers to manage transactions. A cash register is one type of POS. Cash registers have virtually been replaced by credit and debit card-accepting electronic point-of-sale (POS) terminals.

A tangible object at a physical store or the checkout section of an online retailer can serve as a point of sale (POS). A point of sale is the place where a customer completes the purchase for goods or services and where sales taxes may be payable (POS). Customers may now electronically place orders, make reservations, and pay their bills with point-of-sale (POS) systems, which are becoming more and more engaging, especially in the hospitality sector. An increasing number of people have begun to accept digital payments since the invention of technology. By offering an automated point of sale system, which enables these businesses to give their clients greater convenience, commercial banks have recognized the opportunity to offer their clients high-quality services.

V-Mobile Wallet (CBE Birr)

Wallet banking sometimes referred to as mobile wallet banking, is the process of conducting financial transactions and managing accounts via a digital wallet application on a mobile device. Many kinds of financial data can be stored in these digital wallets. Users can use it to do a variety of financial transactions, such as paying for goods and services at physical stores, online. Users of mobile wallets often use them to make direct payments for other recurring expenses like phone and energy bills. Through the use of mobile wallets and Near Field Communication (NFC) technology, contactless payments can also be made by merely tapping a compatible mobile device at point-of-sale terminals.

VI -Electronic Fund Transfer (EFT)

The Electronic Fund Transfer (EFT) technology allows money to be transferred directly between bank accounts without the need for the exchange of paper money. It is a popular method for a variety of transactions and is quick and easy to transfer money.

Using electronic device technology, fund can be switch between bank accounts through an electronic funds transfer, or EFT. The digital method of transferring money between banks is called an electronic funds transfer. An electronic money transfer can be started by everyone who

has a bank account. Sending or receiving physical checks can often be slower and less secure than using an electronic payments transfer.

2.1.11 Profitability as a bank Performance measurement

Profit as a measurement of performance refers to the evaluation of a bank's financial success and efficiency in generating earnings relative to its expenses and costs over a specific period. It is a key indicator of the institution's ability to manage its resources effectively, deliver value to shareholders, and sustain operations. In this context, profit is often analyzed using various metrics, such as net profit, return on assets (ROA), and return on equity (ROE), which provide insights into different aspects of the bank's performance (Harvard Business Review, 2019). According to Ogden and Watson (1999), profitability is always viewed as a sign of a company's success and a crucial gauge of its economic performance. It is also thought to be a useful instrument for assessing a company's performance in terms of its ability to make money and its managerial effectiveness. In his research on evaluating the profitability of commercial banks, Rasiah (2010) noted that a measure of profitability indicates the amount of money the bank makes from the investment of its shareholders. The adoption of financial technologies like digital payments has an impact on banks' performance and profitability, while other factors like management of a bank's assets and liabilities also have the potential to affect banks' profitability. The most basic indicator of bank profitability is return on assets, or ROA. It displays a bank's capacity to earn a profit from its asset management operations. Profitability is a suitable indicator to measure company performance (Masdupi & Defri, 2012).

2.1.12 Benefits and challenges of Financial Technology

2.1.12.1 Benefits of Financial Technology

Technology has always advanced, even in the banking industry, but digital innovation has made a big difference in system connectivity, computing power and cost, as well as newly created and relevant data. These developments have brought down the cost of transactions and made room for new rivals and business plans. Financial services can now be produced at lowest cost because of technological advancements that have reduced transaction costs and improved information transfer. Specialized players have untangled financial services, allowing consumers to choose and assemble their perfect product suites. Efficiency is also increased by new technologies like "Block Chain" (Peters & Panayi, 2016; Wood, 2015) Due to the regulatory framework, banks are

typically less inclined to adopt new technology fast (Hannan & McDowell, 1984). Additionally, banks frequently rely on decades-old IT infrastructure; therefore these developments are projected to benefit FinTech firms more. BlockChain technologies have the potential to enable near-instantaneous settlement, and Peters and Panayi (2016) claim that several markets will benefit from lowering counterparty and settlement risks through the reduction of the settlement cycle from three days to two days.

We outlined the primary opportunities as follows, based on worldwide specialized reports and studies:

Greater access to capital: Peer-to-peer (P2P) and equity crowd fund (ECF) platforms are a good example of this, as they offer credit to borrowers—SMEs in particular—who are unable to obtain bank loans and create new avenues for obtaining equity financing (Cumming et al., 2021).

Financial inclusion: Thanks to digital banking, underprivileged populations now have improved access to financial services. Technology is accessible in remote places. Fintech platforms are concentrating more on larger-scale transactions via electronic copies and are shifting towards firm and executable orders (World Bank, 2021). Adding additional asset classes is just one facet of this possibility. Some experts on Distributed Ledger Technologies (DLT), for example, note that one benefit of DLT is that it can "tokenize" assets—like energy products, commodities, art, real estate, and private equity—that are expensive to source, transact, and deliver, thereby making them tradable and collateralizable (Harvard Business Review, n.d.).

Tailored banking services: By utilizing the experience of Fintech companies, banks can improve their standard services to be supplied in a flexible and economical manner. For example, banks may employ white-label robot advisers to assist customers with bank loans and offer a more efficient and customized customer experience (Aloulou et al., 2024).

Cost advantage: This result from the fact that Fintech companies provide quicker banking services and lower transaction costs. In the case of cross-border transfers, fintech companies can offer faster banking services at a lower cost. Fintech players may also be able to reduce their expenses and speed up transfers and payments. By cutting the settlement cycle from three days to two days, several markets have benefited from lower counterparty and settlement risks, and block chain technologies may eventually result in almost immediate settlement (Werth et al., 2023).

Regulation Technology (Regtech): Financial institutions can pursue regulatory objectives and comply with regulatory requirements with the use of modern, innovative technologies (like prudential standards including reporting, consumer protection). Fintech provides banks with more efficient means of enhancing their risk and compliance management. It might also be a way to reduce the expenses associated with fulfilling the necessary standards and adapt to changes in the regulatory landscape (Aloulou et al., 2024).

Enhancement in security: The security that is incorporated into the block chain through block encryption and block connectivity is one of the fundamental advancements in financial security. Furthermore, with current technology, it is more difficult to attack every node in a block chain than it is to attack a central database. FinTech platforms also offer a range of techniques to safeguard privacy and stop information leaks (Werth et al., 2023).

2.1.12.2 Challenges of Financial Technology

Like any other development, fintech has many benefits and potential, but it also comes with a host of risks that straddle numerous industries and can include elements of both strategic and tactical risk. The main factors contributing to Fintech risks and hazards are worries about operational risk, compliance, liquidity and volatility of bank funding sources, and intense rivalry (Werth et al., 2023).

Competition on market share: The potential for swiftly disentangling bank services from banks to fintech or BigTech enterprises increases the risk to the profitability of individual banks. Established financial institutions run the danger of losing a sizable amount of their market share or profit margin if new competitors are able to better use innovation and offer lower-cost services that better meet consumer expectations (Frost et al., 2019).

Danger of network failure and fraud: It is obvious that digital banking is heavily reliant on the internet network system. Hence, network failure or interruption is another threat to digital banking. When bank customers use digital platforms for their banking needs, fraud may occur (Jagtiani and Lemieux, 2018).

Customer Trust: Since clients of digital banks are unable to visit a physical branch, they must rely on simple and effective customer care systems, which makes consumer trust essential. As digital banking is still in its infancy, older clients may be wary of using its services, particularly if they require complex technological know-how (Werth et al., 2023). As a result, digital banking

companies will need to provide reliable, user-friendly systems that are supported by first-rate customer service and clear channels of communication, all while adhering to best practices.

Regulations: Regulation is essential to the industry's long-term survival, as regulators ensure the safe and secure operation of digital banks. In response to the increase in digital transactions, regulators are developing new policies and procedures (Anagnostopoulos, 2018). Digital banks will need to find the right balance between promoting innovation and protecting consumers by strategically investing in a robust digital banking infrastructure and staying aware of the most recent market demands.

Money laundering and countering the financing of terrorism: Increased automation and distribution of products or services among banks and FinTech firms may lead to less openness about the execution of transactions and compliance responsibilities. Because platforms may only provide execution-only, informational, and matching services, they may argue that they do not engage in regulated activities, increasing the risk of conducting general solicitation and unlicensed activities (Buckley et al., 2020).

Data privacy: Failure to comply with data privacy standards may become more risky due to the expansion of big data, greater outsourcing as a result of collaborations with fintech companies, and the consequent struggle for control of the customer relationship. If a platform managed by unregistered organizations becomes accessible, this risk can increase (Buckley et al., 2020).

Cyber-hazard: The financial system may be more vulnerable to cyber-attacks and exposed to potential breaches if it relies more on cloud computing, application programming interfaces (APIs), and other developing technologies that promote more interconnectedness (Buckley et al., 2020).

Risk related to liquidity and volatility of bank funding sources: Thanks to the use of aggregators and new technologies, investors can now choose to automatically transfer between several mutual funds or savings accounts in order to obtain a greater return. While efficiency might increase as a result, client loyalty might suffer and deposit volatility might increase. As a result, banks may be exposed to higher liquidity risk. (Buckley et al., 2020).

2.1.13 Risk of Financial Technologies and Mitigation

Despite the benefits and opportunities of financial technology, financial technologies may suffer from challenges and risks related to the new innovations. Risks associated with financial

technologies include securities risk, technical risk, regulation risk, financial risk and high operational risk (Arner et al., 2016).

Securities Risk: Certain of the most well-known cyber-attacks that have affected vital economic infrastructures demonstrate how serious the cyber security threats facing the FinTech industry are. Important corporate data could be stolen as a result, technology could be purposefully destroyed, and services could suffer. Consumers that use fintech run the risk of experiencing loss of privacy, compromised data security, and increased fraud and scam threats, to name a few.

Technical Risk: Because financial technology has not yet made significant strides in security, its reliance on information systems and technical flaws will limit its security performance and increase the range of security issues. Furthermore, the required risk assessment has not been given to the implementation of new technologies. Because of this, some businesses heedlessly seek out so-called subversive technologies without doing thorough testing and risk assessments. This would weaken fintech's security performance and broaden the range of security issues.

Risk associated with regulations: laws are either out of date or incomplete. For example, there are less strict rules and safety precautions governing digital wallets, deposits, and internet banking than there is for traditional banks. Fintech's handling of money, data, and consumers' privacy across borders makes it more complex. Fintech entered the market quickly, bringing with it complex business procedures and no defined regulatory framework for the sector. Fintech services therefore carry a greater risk of compliance or regulatory issues. For instance, the current laws, rules, and oversight guidelines in the banking sector have a lot of blind spots and loopholes**.** The absence of legal protection and oversight in this sector gives rise to certain illicit enterprises. Legal flaws could be exploited by criminals to commit crimes and other illicit acts, costing financial institutions money.

Financial Risk: The word "financial risk" refers to the possibility of suffering a monetary loss in financial transactions as well as the eventual inability of financial institutions to settle their debts. Market risk, operational risk, liquidity risk, and credit risk are the four categories of financial risk. Market risk arises when a corporation experiences fluctuations in the equities market, credit spreads, interest rates, and commodities prices. Errors, damages, or pauses in the operational process are the sources of operational risk. The incapacity of banks to obtain funds for funding

commitments is known as liquidity risk. When counterparties and borrowers don't fulfill their end of the bargain, credit risk arises.

High operational risk: The emergence of new products and services could complicate the delivery of financial services, making operational risk management and control more difficult. It is likely that obsolete bank IT systems are not adaptable enough, or that change management and other implementation strategies are not being used to their full potential. Reliance on robo-advisers is the main source of this kind of risk, as it can result in technological problems such algorithmic errors, overly complex or simplistic algorithms, and static client data.

Risk Mitigation

To reduce risk, financial institutions need to have effective plans and procedures. To prevent application, transaction, and marketing fraud, financial institutions must prioritize the development of effective anti-fraud policies based on product qualities (Fang et al., 2021). In order to monitor external risk scenarios, such as rising cybercrime or trends in illicit property, financial institutions should also have effective risk mitigation plans in place and be prepared to act fast when dangers materialize. It is imperative for financial institutions to create and innovate their own technology models in order to mitigate a range of risks.

2.2 Empirical literatures

Numerous empirical studies have produced definitive results about the impact of the information technology (IT)-based approach of delivering banking services on bank profitability. Regarding the impact of fintech on bank profitability, there are two main points of view. According to Solow (1990), increased use of information technology has little effect on profitability or production. BW Kinuthia (2010) reports that a study on the effect of financial innovation on profitability conducted in Kenya revealed that, despite the fact that financial innovation has been linked to increases in profitability, managerial efficiency, business expansion, and other positive outcome. However, it has also brought about certain bad aspects, like greater risk for the banking industry, fraud, moral hazard, and higher operating costs. Additionally, it has caused great annoyance and financial loss as a result of technological failure.

Nonetheless, the majority of recent studies (Kou et al., 2021; Cho & Chen, 2021; Wang et al., 2021) have shown that investing in financial technology has a favourable impact on profitability. The decrease in operating costs and information access may account for the positive effect. The

most crucial thing to remember in this situation is that the fintech system significantly helps businesses lower their operating expenses and boost their profitability. Furthermore, according to Wang et al. (2021), fintech lowers the cost of financial services while increasing profitability and risk control. Fintech's explosive growth enhances the way financial factor markets are allocated while simultaneously helping banks grow. It increases bank profitability and lowers the percentage of non-performing loans (Yang, Y, et al., 2023).The majority of financial institutions employ financial technologies to draw clients by offering more transparent, cost-effective, and user-friendly goods and services. According to a study done to look at how electronic banking affected Pakistani commercial banks' performance, electronic banking significantly improved interest margin, ROA, and ROE for those who adopted it recently, while early adopters saw significant improvements in ROE and interest margin but only marginal improvements in ROA (Rauf & Qiang, 2014).

Banks that use internet banking tend to be larger and have greater ratios of operating performance and profitability than non-internet banking aware banks, according to an Indian study that looked at the impact of internet banking on bank performance and risk (Malhotra, 2009). Fintech offers a means of collaborating, disrupting, and improving business models. According to Le, T.D. and Ngo, T. (2020), IT-based service delivery techniques increase bank profitability; therefore, there should be increased encouragement to expand these channels' capacity to provide banking products and services. Successful financial technology adoption in commercial banks, according to Ky et al. (2019), boosts bank profitability and efficiency, improves client interactions, and creates new customer groups..

FinTech offers a means of collaborating, disrupting, and improving business models. According to Le, T.D. and Ngo, T. (2020), IT-based service delivery techniques increase bank profitability; therefore, there should be increased encouragement to expand these channels' capacity to provide banking products and services. Successful financial technology adoption in commercial banks boosts profitability and efficiency, improves customer interactions, and creates new client segments, claim Ky et al. (2019). According to a 2015 study by Ngango, electronic banking systems including ATMs, Pay Direct, electronic check conversion, mobile banking, and e-transact have a significant impact on a bank's performance because they boost asset value, lower operating costs, and increase profitability. Kariuki (2015) conducted a study that demonstrated

the benefits of e-banking on their banking performance, utilizing bank profits and turnover as performance indicators. The adoption of financial technologies, such as Internet banking, mobile banking, ATM cards, and banking agents, has had a major effect on commercial banks' financial performance.

According to a different study by Hiyam Sujud & Boutheina Hashem1 (2017), bank innovations have an impact on Lebanese commercial banks' financial performance. In particular, bank innovations have a positive impact on the profitability and return on assets of commercial banks. In summary, bank innovations have the potential to increase the profitability and return on assets of commercial banks. Eldana (2017) discovered that through reducing errors in transaction processing, saving time, reducing the chance of cash loss, and improving the bank's operational dependability, e-banking services have a positive effect on the profitability of CBE.

The empirical analysis conducted revealed a positive correlation between bank profitability and electronic banking, encompassing various components such as automated teller machines (ATMs), bank cards, online banking, telephone banking, and point of sale (POS) systems.

In Solomon's (2016) study on the Roles of E-banking on Financial Commercial Banks in Ethiopia, the effect of e-banking on return on assets (ROA), a crucial indicator of profitability, was examined. The research found that commercial banks' financial performance was positively influenced by factors such as the number of ATMs, POS terminals, and market share. Banks with larger market shares were able to expand their operations, leading to increased profitability. The study emphasized the importance of enhancing consumer awareness of e-banking services and providing timely assistance to customers to improve ROA.

Similarly, Shamanth K. and Aparna J. (2022) identified a positive correlation between ATM transactions and the performance of SBI Bank in their study. Increased transaction volume was associated with improved bank performance. Additionally, transactions through POS terminals, Real-Time Gross Settlement (RTGS), and debit cards were found to enhance bank profitability. The findings suggested that the implementation of cashless policies, particularly through POS, RTGS, ATM, and mobile transactions, contributed significantly to the profitability of SBI Bank.

Overall, both studies underscored the importance of electronic banking services in enhancing bank profitability, highlighting the need for banks to invest in and promote such services to maximize their financial performance.

A study on mobile banking and Kenyan commercial banks' operating effectiveness was conducted by Kimani, N. (2015). The study analysed secondary data on the number of registered mobile banking clients, the amount of money moved through mobile banking, bank earnings, and operational costs. The researcher conducted a census survey of the 43 Kenyan commercial banks. The study's findings demonstrate that mobile banking has a favorable and substantial impact on Kenya's commercial banks' operational effectiveness, and it suggests that policymakers should continually consider using mobile banking technologies.

Greater economies of scale may be seen in the banking system with the introduction and development of new depositor service delivery systems including automated teller machines (ATMs), internet banking, and phone centers compared to old branching networks. Additionally, advancements in payment technology, such as card issues with numerous built-in features and point of sale (POS) terminals, may have created scale and network efficiencies in back-office operations and made it easier for people and organizations inside a nation to move funds. A country's payment costs might decrease in real terms when the underlying differences in expenses between paper-based and electronic transactions are linked to the direct costs incurred by users of banking services. According to Humphrey et al. (2006), if a nation can successfully replace standalone branch offices with ATMs and transition from a paper-based to an electronic-based system, it might save 1% of GDP annually. .

2.3 Conceptual framework

The parameters for formulating a research question and determining relevant, meaningful answers to it are outlined in a conceptual framework. It provides the research's theories, assumptions, views, and concepts in a narrative, graphical, or graphic format and makes connections between them. A conceptual framework is an explanation derived from the researcher's synthesis of previous study on particular phenomena.

The conceptual framework of a research study serves as a guiding map, delineating the interconnections between the variables under investigation. It encapsulates the researcher's understanding of how these variables relate to one another, setting the stage for logical inquiry. Through a blend of narrative, pictorial, or graphic representations, it weaves together theories, assumptions, and ideas, providing a structured foundation for the research process. In the case of examining the impact of different digital banking modes on bank profitability, the conceptual

framework illuminates the relationships between the independent variables (such as ATM usage, mobile banking, internet banking, etc.) and the dependent variable (bank profitability). By delineating these connections, the conceptual framework facilitates the formulation of hypotheses and the subsequent analysis, guiding the researcher towards meaningful insights and conclusions.

The conceptual framework for a study examining the impact of various digital banking modes on bank profitability would likely encompass several key components:

Dependent Variable: Bank Profitability - This is the central focus of the study, representing the outcome or result that the researcher seeks to understand or explain.

Independent Variables: Mode of Digital Banking (ATM, mobile banking, internet banking, POS, CBEbirr, electronic fund transfer) - These are the factors being investigated for their potential influence on bank profitability. Each mode represents a distinct aspect of digital banking that may affect profitability differently. The researcher has established the conceptual framework of the study based on reviews of both theoretical and empirical literature.

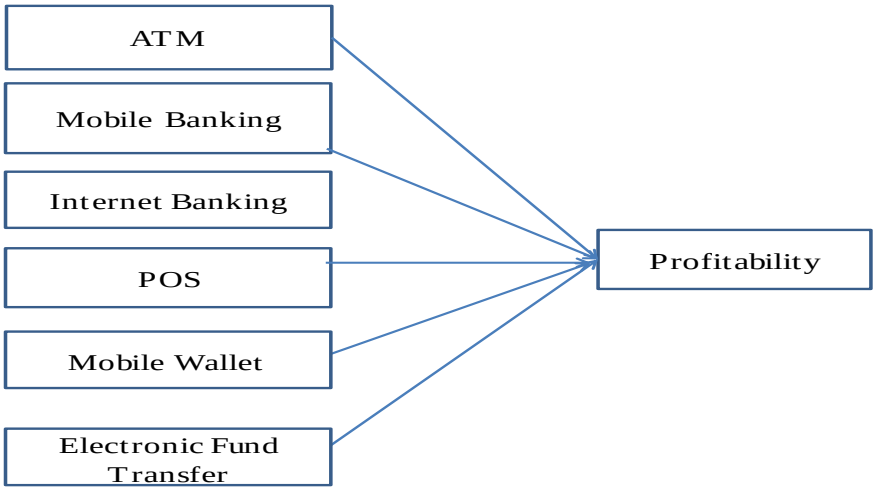


Figure 1: Conceptual framework for fintech and profitability

A conceptual model used to show the relations between the six fintech dimensions (ATM, Mobile Banking, Internet Banking, POS, Mobile Wallet & Electronic Fund Transfer and Bank profitability. Sources: (Researcher own)

Chapter III: Data and Methodologies

3.1. Data Type and Sources

Based on the source from which they are collected, research data are divided into primary and secondary categories. Field surveys, questionnaires, and other methods are commonly used to collect primary data. Secondary data is information obtained from journals, magazines, and other sources that is frequently compiled and made publicly available.

In this study, the researcher used both primary and secondary data. A structured questionnaire, filled out by CBE branch employees working in the city of Addis Ababa, was used to gather primary data. Additionally, secondary data was obtained from various sources, including annual reports, books, periodicals, magazines, websites, and published journals.

3.1.1. Data Collection instrument

Data collection is the process of obtaining information or data from a variety of sources in order to evaluate findings, predict trends and their implications, and find answers to research problems and inquiries. The process of gathering and evaluating data on relevant variables in a systematic and specified way to answer research questions, test hypotheses, and evaluate findings is known as data collection.

In this study, a questionnaire was employed as a data gathering tool. Cohen (2011) defines a questionnaire as a collection of inquiries intended to elicit statistical data from participants in order to meet research goals. It enables the researcher to gather pertinent data required to answer research questions or validate model hypotheses. Statements in the questionnaire are specifically crafted to gauge the impact of financial technologies through the six dimensions of financial technologies: ATM, mobile banking, internet banking, POS, mobile wallet, and electronic fund transfer.

The questionnaire is divided into two sections: the first section asks about the respondent's demographics, and the second section gets their opinions about financial technologies and bank profitability. In this study, the impact of financial technologies on bank profitability is measured using a five-point Likert scale, which is a valuable tool for assessing opinions, attitudes, and behavioral inclinations. The scale scores from strongly agree = 5 to strongly disagree = 1. These answers are utilized for any mathematical study as SPSS quantifies them.

3.1.2. Data Collection Procedures

Primary data was gathered using a structured questionnaire with statements specifically created to gauge the perception of workers on how financial technologies affect bank profitability in the case of the Commercial Bank of Ethiopia. The required data for this study was collected from CBE branch employees working in the city of Addis Ababa. Respondents filled out the questionnaire voluntarily during their business hours. After data collection, the research hypotheses were tested, and conclusions regarding the study's topic were drawn from the analysis of the data.

3.2. Methodology

Research approach and design, research type, sample and sampling procedure, study validity and reliability, and data analysis methodology are all included in the section of a study that deals with research methodology. A research methodology outlines the techniques and strategies used to gather and examine data related to a particular research topic. It is a process by which investigators organize their study to allow them to employ the selected research instruments to achieve their objectives.

3.2.1. Research Approach

Regarding methodology, a study can be categorized as qualitative or quantitative. The study data and results in qualitative research are not sought to be quantitatively or statistically analysed. Its focus was on assessing behavior, attitudes, and opinions. In this situation, the perceptions and insights of the researcher are crucial to the investigation. Qualitative research is conducted using this methodology either produces non-quantitative results or outcomes that are not rigorously quantitatively and analytically analyzed. On the other hand, quantitative research is the methodical, scientific study of the quantitative aspects of relationships and occurrences.

A research that is based on testing a theory, quantified with numerical data, and statistically analyzed is known as quantitative research. The aim of quantitative research is the development and application of mathematical concepts, models, and theories related to research topic. It usually starts with a hypothesis or generalization that suggests a wide connection between variables. According to Leedy and Ormrod (2001), quantitative research aims to provide prediction and explanations that will apply to other people and places. Because this study requires a statistical model to assess the influence or prediction of fintech on Banks profitability,

the researcher has decided to employee quantitative research approach to study the effect of financial technology on Banks profitability.

3.2.2. Research Design

Research design is a blueprint that outlines a thorough strategy for carrying out a research project, including operationalizing variables so they can be measured, choosing a study sample, gathering information to support hypothesis testing, and interpreting the findings. Assessing how financial technology affect bank' profitability is the goal of the study. Hence,the researcher choose the descriptive and explanatory research design in order to accomplish the study's research objectives and address the problem statement. To demonstrate how the predictor variable influences, or is "responsible for," changes in the predicted variable, explanatory study design is favoured. Therefore, the researcher prefers to use an explanatory research methodology to look at how fintech affects bank profitability.

This study's main goal is to investigate how digital banking affects bank profitability. An explanatory study design using a quantitative methodology is employed to accomplish this goal.

According to Marczyk et al. (2005), the explanatory kind of research design aids in determining and assessing the causal linkages between the independent and dependent variable under investigation. Because it is useful for elucidating cause-and-effect linkages between dependent and independent variables and fulfills the study's aims, the researcher used an explanatory research design.

Descriptive research is significant since it aims to characterize current circumstances without examining the connections between variables; additionally, it investigates, clarifies, and offers supplementary data on a subject. Because it describes respondent profiles, traits, behaviors, or phenomena of a certain subject or community without changing variables, descriptive research is crucial for this kind of study.

3.2.3. Population and Sampling

Population of the study is the complete list of group or set of individuals, things, or events that have certain character and are of interest to the researcher. The population can also refer to the total number of units (individuals, groups, events, objects, or things) from whom study samples are selected. It acts as a sample chosen from the complete population and a representation of that

population. The research population is defined by the study's objectives as well as the specific characteristics or factors under investigation.

The whole group of individuals taken into consideration for the study is known as the population. Therefore, every employee of the Commercial Bank of Ethiopia who works at the branch level in the city of Addis Ababa makes up the population of the current study.

Sampling

Sample size determination is the process of figuring out how many observations or people to include in a sample from a larger group. The goal of determining the sample size should be to produce a manageable and cost-effective sample that is large enough to produce results that are statistically significant and accurate population parameter estimations.

A sample is a portion of data that is picked or selected from a larger population by a researcher utilizing a set of preset selection criteria.

Creating a sample is a useful method for conducting research. Population-wide research is sometimes costly, time-consuming, and unfeasible. Consequently, the researcher gains knowledge from examining the sample that can be applied to the entire population. The intentional selection of people based on their characteristics, knowledge, experiences, or other criteria is known as purposeful sampling. Purposive sampling method is applied in this research, as the researcher wants to collect data from CBE branch employees who are senior and experienced and believe that they can provide relevant information for the study.

Sample Size

The sample size in relation to the population was estimated or determined by the researcher using the Taro Yamane (1967) formula. When the population is known and finite, the Taro Yamane formula is used to calculate the sample size. This study used the Taro Yamane formula for sample size determination, as the CBE employees in Addis Ababa city are known and finite in number. The formula developed by Taro Yamane in 1967 is used to calculate sample size.

n = N / (1 + Ne^2)

Where:

n = sample size N = population size

e = margin of error (e.g. 0.05 for 5% margin of error)

Suppose we want to calculate a sample size for this study from known population with 5% margin of error.

As per the Commercial Bank of Ethiopia Human Resources Management Directorate data as of June 2024, CBE has a total of 20,063 employees in the city of Addis Ababa. Based on this, the researcher employed the Taro Yamane formula to calculate the sample size.

Let us calculate the sample size using Taro Yamane's (1967) formula:

N = 20,063, **e** = 5% and **no** = sample size.

$$no = \frac{20,063}{1+20,063(0.05)^2} = 392$$

3.2.4. Reliability and Validity

Reliability refers to the degree of consistency in measurements, determined by the frequency, conditions, and various instruments used to measure the same object. Essentially, it involves the consistency of measurement (Bollen, 1989) or the stability of results across different settings, ensuring similar outcomes (Nunnally, 1978).

To examine the dependability of the questionnaire, the researcher conducted a pre-test using Cronbach's coefficient to verify reliability. A pilot study with thirty respondents was carried out to evaluate the consistency and dependability of the research tool. Cronbach's alpha was used to assess reliability and internal consistency, and the results in table 1 showed alpha coefficients of 0.97, which exceed the acceptable threshold of 0.7 recommended by Nunnally (1987) as a measure of dependability.

Table 1: Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Number of Items
0.97	0.97	35

Sources: Survey Own ,2024

Table 2 below illustrates that all Fintech dimensions or constructs have appropriate reliability, with each construct's pilot test result exceeding the necessary threshold value of 0.7 for the instrument to be considered reliable.

Hence, Table 2 below displays the Cronbach's alpha test findings for each fintech dimensions and bank profitability, demonstrating the consistency and reliability of the instrument.

Table 2: Reliability Statistics of fintech dimensions

Items	Number of items	Cronbach's Alpha
ATM	5	0.81
Mobile Banking	4	0.86
Internet Banking	5	0.84
POS	5	0.84
CBEbirr	4	0.84
Electronic Fund Transfer	5	0.84
Profit	7	0.89
Overall reliability	35	0.97

Sources: Survey Own, 2024

Validity refers to the extent to which an instrument accurately measures what it is intended to measure. Before developing the questionnaire, the researcher extensively reviewed literature on financial innovation, focusing on works by academics who examine financial technology and profitability from a banking perspective. It is believed that the construct validity of the questionnaire holds since it was created following a careful examination of scholarly literature.

3.2.5. Data Analysis

Structured surveys are used to collect data, which is then cleaned, coded, and corrected. The purpose of the structured questionnaire is to investigate the impact of variables related to financial technology on the profitability of Commercial Bank of Ethiopia. The Statistical Package for Social Science 26 (SPSS 26) is used to analyze the data. Multiple regression analysis, correlation analysis, and descriptive and inferential statistics were used to analyse the data. When describing the current state of an ATM, mobile wallet, internet banking, POS system, and electronic fund transfer, frequency distribution and mean values are utilized. To investigate the link between the dependent variable and the explanatory variables, a Pearson correlation matrix was employed. The study employed multiple regression analyses to examine the potential correlation between the financial technology of the bank and its profit margin. Additionally, the study aimed to identify the key financial technology explanatory variables that have the greatest impact on the profitability of Commercial Bank of Ethiopia. To ascertain whether or not the model has statistically significant predictive power overall, ANOVA was employed.

3.2.6. Ethical Consideration

Prior to completing the questionnaires, participants were informed about the aim of the research and asked to provide their responses voluntarily. Respondents were assured that their personal information would be kept confidential and used exclusively for this particular study.

3.2.7. Model specification

The process of specifying a regression model is indeed critical, as it directly impacts the validity and reliability of the estimation results. Theoretical considerations play a fundamental role in guiding this process, as the model should reflect the underlying causal relationships between the independent and dependent variables.

In line with economic theory and the goals of the study, researchers must carefully select the independent variables that are theoretically relevant to the phenomenon under investigation. These variables, often termed exogenous factors, should align with the assumptions of the estimation method being employed. Deviations from these assumptions can lead to biased and unreliable estimates.

Importantly, the inclusion or exclusion of independent variables should be guided by economic theory rather than solely empirical or methodological factors. The theoretical framework provides a principled basis for determining which variables are essential for explaining variations in the dependent variable.

Excluding key variables that are theoretically significant can introduce bias into the estimation results, potentially leading to erroneous conclusions. Conversely, including irrelevant variables in the regression equation can inflate the variance of the estimates without improving the model's explanatory power.

Model specification entails the careful selection of variables to be included in the regression model. This process should be guided by theoretical considerations and informed by prior literature and expert knowledge. By reviewing the model specification before estimation, researchers can mitigate the risk of specification errors that may compromise the robustness and reliability of the estimation results.

In the context of analyzing the impact of financial technologies on the profitability of Commercial Bank of Ethiopia, the researcher opts for multiple regression analysis with independent variables such as ATM, mobile banking, internet banking, and point of sale, mobile

wallet, and electronic fund transfers. These variables are chosen based on their theoretical relevance and alignment with the goals of the study, ensuring that the regression model reflects the underlying economic relationships of interest.

The research model equation is described as follow.

$$Yi=\beta 0+\beta 1\text{ATM}_i+\beta 2MB_i+\beta 3IB_i+\beta 4POS_i+\beta 5MW_i+\beta 6EFT_i+\varepsilon_i$$

Where:

- Yi is the dependent variable for observation i ,
- $\beta 0$ is the intercept,
- $\beta 1$ through $\beta 6$ are the coefficients for each independent variable,
- $\text{ATM}_i+\text{MB}_i+\text{IB}_i+\text{POS}_i+\text{MW}_i$ and EFT_i are the independent variables for observation i
- ε_i is the error term for observation i .

Chapter IV: Results and Discussion

The ultimate goal of the study is realized through the summarization and analysis of the data. SPSS version 26 was used to analyze the data using ANOVA, regression, correlation, and descriptive statistics. Regression analysis is specifically used to assess research hypotheses and provide answers to research questions.

4.1. Data cleaning and editing

Data cleaning and editing must be completed before data is processed for statistical analysis and interpretation. This is to guarantee that missing responses are handled properly to minimize their negative impacts by giving a suitable value (neutral or imputed). Additionally, data editing verifies that the survey's values are within the range of the maximum and minimum values. For example, if the survey used a five-point Likert scale to measure the question, the numbers should fall between 1 and 5, and any values outside of this range would suggest that the data was submitted wrongly. In order to verify that data is properly or accurately entered into SPSS and that missing elements are appropriately processed, the researcher has thus performed both data cleaning and editing.

4.2. Demographic Profile of Respondents

The demographic profiles of the respondents are displayed in Table 3 below. It can be inferred that the respondents' gender composition is about equal, with 55% of them being female and 45% of them being male.

The age distribution of the respondents is shown in Table 3. Six percent of the respondents overall were in the 18–25 age range. In this age bracket, 22 individuals answered the survey. 213 out of the total responders, or 63% of the total, are between the ages of 36 and 45. Given that most respondents are in this age group, it may be assumed that most of them are knowledgeable and experienced..

In terms of the respondents' educational backgrounds, Table 3 below also shows that 128 respondents, or 36% of the total, hold an MA or M.Sc., while 180 respondents, or 51% of the total, hold a first degree, making them the majority of respondents in this regard. Six percent of the respondents, or 22 people, have a diploma.

Regarding the work experience of respondents with CBE, table 3 below shows that 99 respondents, or 28% of the total respondents, had worked with CBE for fewer than five years. Of the total respondents, 162 had job experience ranging from five to ten years, making up 46% of the sample. Of those with more than ten years' worth of work experience, 89 respondents made up 26% of the total.

Table 3: Demographic profile of respondents

Variables	Categories	Frequency	Percentage
Gender	Male	158	45
	Female	192	55
Age Group	18-25	22	6
	26-35	65	19
	36-45	213	61
	46-55	39	11
	Above 56	11	3
Educational Level	Certificate	20	6
	Diploma	22	6
	First Degree	180	51
	MA/M.sc	128	36
	Ph.D. Degree	-	-
Work Experiences	<5 years	99	28
	5-10 years	162	46
	>10 years	89	26
Positions	Branch Banking officer	101	29
	senior Branch Banking officer	63	18
	CRM Manager	56	16
	CS Manager	49	14
	Operation Manager	44	13
	Branch Manager	37	11

Sources: Survey Own ,2024

The positions of the respondents are also shown in table 3 above; as a result, of the total respondents, 101 respondents or 29% were branch banking officers. Senior branch banking officers made up 63 out of the total responders, or 18% of the total. Customer relationship managers made up 56 of the respondents, or 16% of the total. Although customer service managers made up 49 respondents, or 14% of the total, operational managers and branch managers made up 13% and 11% of the respondents, respectively.

4.3. Descriptive Statistics of Financial technology

This section provides an example of the descriptive statistics utilizing the mean and standard deviation for each major construct and its dimensions. Six dimensions are used to depict financial technology. Through the use of a structured questionnaire, a total of 35 statements were made available to bank employees in order to gauge their level of agreement or disagreement with the impact of financial technology on bank profitability. The statistical mean and standard deviation are computed using the employees' questionnaire replies.

Table 4: Descriptive statistics of fintech dimensions and profitability

Fintech dimensions & Profitability	N	Mean	Std. Deviation
ATM	350	3.52	0.80
Mobile Banking	350	3.57	0.89
Internet Banking	350	3.63	0.77
POS	350	3.63	0.77
CBEBirr	350	3.41	0.85
EFT	350	3.61	0.78
profit	350	3.61	0.77
Valid N (listwise)	350		

Sources: Survey Own ,2024

Table 4 displays that of descriptive statistics of financial technology variables; CBEBirr has the lowest mean value (3.41) with standard deviation (0.85), while online banking and point of sale (POS) have the highest mean value (3.63) with standard deviation (0.77). Bank profitability, the dependent variable, has a mean value of 3.61 and a standard deviation of 0.77. When data are widely distributed, it indicates that employees have a range of opinions; when data are closely spaced, it indicates that employees have similar opinions.

4.3.1. Descriptive Statistics of Automated Teller Machine (ATM)

An automated teller machine (ATM) is a type of electronic banking facility where bank customers can perform routine transactions without the assistance of a teller or branch personnel. The five questions which expressed ATM machine contribution to bank profitability were analyzed using descriptive statistics. Responses to the five ATM questions which are presented using five-point Likert scale ranges from strongly agree to strongly disagree.

The five questions under the ATM construct were used to determine the employees' perceptions of the ATM's impact on bank profit earnings. The results of the descriptive

statistics showed how much CBE employees agreed or disagreed with statements made about the automated teller machines' (ATMs) impact to bank profitability. The statements were provided on a 5-point Likert scale. The highest mean value number represents a high degree of agreement, while the lowest mean value shows a considerable level of disagreement.

. Table 5 : Descriptive Statistics of Automated Teller Machine

Statements	N	Mean	Std. Deviation
ATMs have had a positive effect of increasing commission fee based income	350	3.38	1.14
ATMs have expanded the income generating potential of the bank	350	3.49	1.06
ATMs have low maintenance costs leading to high levels of profitability over their economic lifetime	350	3.72	0.99
ATMs influence reduction of operational costs and hence better return on assets for the bank(profitability)	350	3.55	0.95
24 Hrs a day,7 days a week and 365 days a year availability of ATM service makes positive contribution to CBE profitability	350	3.45	1.12
Valid N (listwise)	350		

Sources: Survey Own ,2024

The statement "ATMs have low maintenance costs leading to high levels of profitability over their economic lifetime" has the greatest mean value (3.72) with SD (0.99), as seen in Table 5 above. This suggests that the majority of respondents agreed that ATMs' minimal maintenance costs boost a bank's profitability. The statement "ATMs have had a positive effect of increasing commission fee based income" has the lowest mean value (3.38) and standard deviation (1.14). This shows that the statement "ATMs have had a positive effect of increasing commission fee based income" is not highly agreed upon by respondents.

4.3.2. Descriptive Statistics of Mobile Banking (MB)

The process of doing financial transactions using a mobile device, tablet, smartphone, etc is known as mobile banking. One benefit of mobile banking is that it allows you to bank whenever and wherever you choose. The findings of the descriptive statistics indicate the extent to which CBE staff members concur or disagree with the claims made in order to evaluate how mobile banking affects bank profitability. When it comes to the specific

statements, the highest mean value indicates a high degree of agreement and the lowest mean value indicate low level of agreement. The statement "Income from mobile banking has a high margin, hence contributing positively to bank annual profitability" has the greatest mean value (3.66) with SD (1.05), as Table 6 below illustrates indicates that respondents agree with the proposition that says “Income from mobile banking has a high margin, hence contributing positively to bank annual profitability".

Table 6:Descriptive Statistics of Mobile Banking

Statements	N	Mean	Std. Deviation
Incomes from mobile banking have had positive impact on bank income margins	350	3.62	1.089
Income from mobile banking has high margin hence contributing positively to bank annual profitability	350	3.66	1.05
Mobile banking application has low maintenance costs leading to high levels of profitability over their economic lifetime	350	3.58	1.01
Mobile banking has expanded the income generating potential of the bank	350	3.43	1.09
Valid N (listwise)	350		

Sources: Survey Own ,2024

As we further look at the above Table 6, we find that the statement "Mobile banking has expanded the income-generating potential of the bank" has the lowest mean value (3.43) with SD (1.09), suggesting that there is little agreement on this statement by respondents.

4.3.3. Descriptive Statistics of Internet Banking (IB)

Customers can access banking services online with internet banking, sometimes referred to as online banking or e-banking, which is a service provided by banks and other financial institutions. Consumers can take advantage of all minor services without physically visiting the branch location of their bank. Users of online banking can transfer money using a variety of methods, including real-time gross settlement (RTGS). They have the ability to move money between their accounts, to other accounts in the same bank, and to accounts in other banks. The proposition that "Use of internet services has added to more profitable business avenues for the bank" is one of the items on the questionnaire used to assess the impact of online banking on bank profitability. As Table 7 shows, this item has the highest mean value (3.82)

with SD (0.96), indicating that respondents agree with the statement.

Further examination of Table 7 below reveals that the statement “Internet banking has a positive effect of increasing commission fee based income” has the lowest mean value (3.51) with SD (1.01),indicating that respondents on average have low level in agreement on this point

Table 7: Descriptive Statistics of Internet Banking

Statements	N	Mean	Std. Deviation
Internet banking has a positive effect of increasing commission fee based income	350	3.51	1.01
Internet banking has expanded the income generating potential of the bank	350	3.53	1.00
Income from Internet Banking has high margin hence contributing positively to bank profitability	350	3.62	0.96
Use of internet services has added to more profitable business avenues to the bank	350	3.82	0.96
Use of internet services has increased customers access to bank services	350	3.68	0.98
Valid N (listwise)	350		

Sources: Survey Own ,2024

4.3.4. Descriptive Statistics of Point of Sale (POS)

An electronic device known as a POS (Point of Sale) machine allows customers to pay a merchant using debit, credit, or prepaid cards, or by scanning a QR code, in exchange for products or services rendered. For a successful transaction, the merchant may provide an electronic receipt or a printed receipt.

Table 8 below illustrates that, of all the statements assessing the contribution of point-of-sale (POS) systems to bank profitability, the statement stating that " CBE's POS terminals have a positive impact in increasing revenue of the Bank " has the highest mean value (3.87) with standard deviation (0.97), indicating that respondents concur with the proposition.

The statement "Transactions conducted through POS contributes to Bank profitability" has the lowest mean value (3.44) and SD (1.06) of all the statements in Table 8, which further suggests that respondents on average have little agreement on this point.

Table 8: Descriptive Statistics of Point of Sales

Statements	N	Mean	Std Devation
POS terminals have had a positive effect of increasing income of the Bank	350	3.87	0.97
POS terminals investments have payback period of less than 3years and hence good return on assets	350	3.63	0.98
Income from POS terminals has high margin hence contributing positively to bank annual profitability	350	3.68	0.93
POS terminals have low maintenance costs leading to high levels of profitability over their economic life time	350	3.53	0.98
Transactions conducted through POS contributes to Bank profitability	350	3.44	1.06
Valid N (listwise)	350		

Sources: Survey Own ,2024

4.3.5. Descriptive Statistics of CBEBirr

A mobile wallet account called CBEBirr is used to pay for things like utilities, DSTV, taxes, travel, airtime, and other expenses. To make payments, an e-wallet must be connected to a person's bank account. Pre-paid accounts of the CBEBirr kind allow users to save money for use in future online transactions. A password is required to access an e-wallet.

Table 9:Descriptive Statistics of CBEBirr

Statements	N	Mean	Std Devation
Adoption of CBE Birr wallet banking products and services reduce the cost of handling transactions by	350	3.46	1.03
Adoption of CBE Birr wallet is helping to have more bank customers who want to conduct bill payment transactions via CBE birr	350	3.58	1.00
Adoption of CBE Birr wallet reduces the cost of handling cash and the risk of carrying cash.	350	3.47	1.05
Adoption of CBE Birr wallet influence reduction of operational costs and hence better return on assets for the bank	350	3.42	1.08
Valid N (listwise)	350		

Sources: Survey Own ,2024

As it is shown in above Table 9, of all statements on the questionnaire to assess CBEBirr contribution to bank profitability, the statement that says “Adoption of CBE Birr wallet is

helping to have more bank customers who want to conduct bill payment transactions via CBE birr" has the highest mean value (3.58) with SD (1.00), and it indicates that respondents agree with the proposition that "Adoption of CBE Birr wallet is helping to have more bank customers who want to conduct bill payment transactions via CBE birr." As we further look at the above Table 9, we find that the statement "Adoption of the CBE Birr wallet influences operational cost reduction, improving the bank's return on assets" has the lowest mean value (3.42) and SD(1.08), suggesting that there is little agreement on this statement by respondents.

4.3.6. Descriptive Statistics of Electronic Fund Transfer

The electronic movement of funds using computer-based systems from one bank account to another, either within the same financial institution or across several, without the direct involvement of bank employees is known as electronic funds transfer, or EFT.

As it is shown in below Table 10, of all statements on the questionnaire to assess Electronic Fund Transfer contribution to bank profitability, the statement which says "Electronic financial transfers have increased the bank's capacity to generate revenue" has the highest mean value (3.89) with SD (0.91), and it indicates that respondents agree with the proposition that "Electronic financial transfers have increased the bank's capacity to generate revenue"

Table 10:Descriptive Statistics of Electronic Fund Transfer

Statements	N	Mean	Std Devation
Electronic funds transfer has a positive effect of increasing commission fee based income	350	3.47	1.02
Electronic funds transfer has expanded the income generating potential of the bank	350	3.89	0.91
Incomes from electronic funds transfer have a positive impact on bank income margins	350	3.60	0.93
Electronic funds transfer enables the bank to reduce stationary and transactions handling cost by making the transaction paperless	350	3.45	1.08
Income from electronic funds transfer has high margin hence contributing positively to bank annual profitability	350	3.63	1.06
Valid N (listwise)	350		

The statement "Electronic funds transfer enables the bank to reduce stationary and transactions handling cost by making the transaction paperless" has the lowest mean value (3.45) and SD (1.08) of all the statements in Table 10, which further suggests that respondents are with little

agreement on this point.

4.3.7. Descriptive Statistics of Bank profit

Bank profit, also known as net income or net profit, is the amount of money that a bank has left over at the end of a given period of time, usually a fiscal quarter or year, after all costs have been paid. This figure is a crucial indicator of the bank's profitability and represents its financial performance. Banks get their money from a variety of sources, including fees from digital transactions, account maintenance & transaction, and interest from loans.

Table 11:Descriptive Statistics of Bank Profit

Statements	N	Mean	Std Devation
Investment in ATMs in mostly motivated by profits to the bank	350	3.60	1.02
ATMs investments have payback period of less than 5 years and hence good return on assets	350	3.54	0.98
Investment in Mobile Banking in mostly motivated by profits to the bank	350	3.44	1.06
Internet banking influence reduction of operational costs and hence better return on assets for the bank	350	3.57	0.94
POS terminals influence reduction of operational costs and hence better return on assets for the bank	350	3.58	0.98
Adoption of CBE Birr wallet influence reduction of operational costs and hence better return on assets for the bank	350	3.67	0.94
Electronic Fund Transfer influence reduction of operational costs and hence better return on assets	350	3.83	0.96
Valid N (listwise)	350		

Sources: Survey Own ,2024

In Table 11 above, it's evident that among the questionnaire statements aimed at gauging bank profitability, the statement asserting that "Electronic Fund Transfer leads to lower operational costs and consequently higher return on assets" stands out with the highest mean value of 3.83 and a standard deviation of 0.96. This suggests that respondents generally agree with the notion that "Electronic Fund Transfer contributes to reducing operational costs and thus improving return on assets." Continuing to examine Table 11, we observe that the statement "Investment in Mobile Banking is primarily driven by the bank's pursuit of profits" exhibits the lowest

mean value of 3.44 and a standard deviation of 1.06, indicating limited consensus among respondents regarding this assertion.

4.4. Descriptive Statistics of open ended questions

Two open-ended questions were presented to CBE employees to give their free opinion regarding the benefits and challenges that digital banking brought to CBE, and the responses were summarized as follow:

4.4.1. Benefits or advantage of Digital banking in CBE

Digital banking has provided numerous opportunities and benefits to CBE and its customers. According to respondents' responses, the benefits or advantages of digital banking are expressed in terms of cost savings, customer satisfaction and efficiency, reduced queues at branches, and the convenience of accessing financial services at any time and from anywhere.

Table 12:Benefits or advantages of Digital Banking

Benefits or advantage of digital banking	Percent	Cumulative Percent
Cost minimization	38%	38%
Customer satisfaction and efficiency	15.4%	53.4%
Less customer queue at branches	28.6%	82%
Convenience to use any time and any where	18%	100%
Total	100	

Figure 1:Benefit or advantage of digital banking

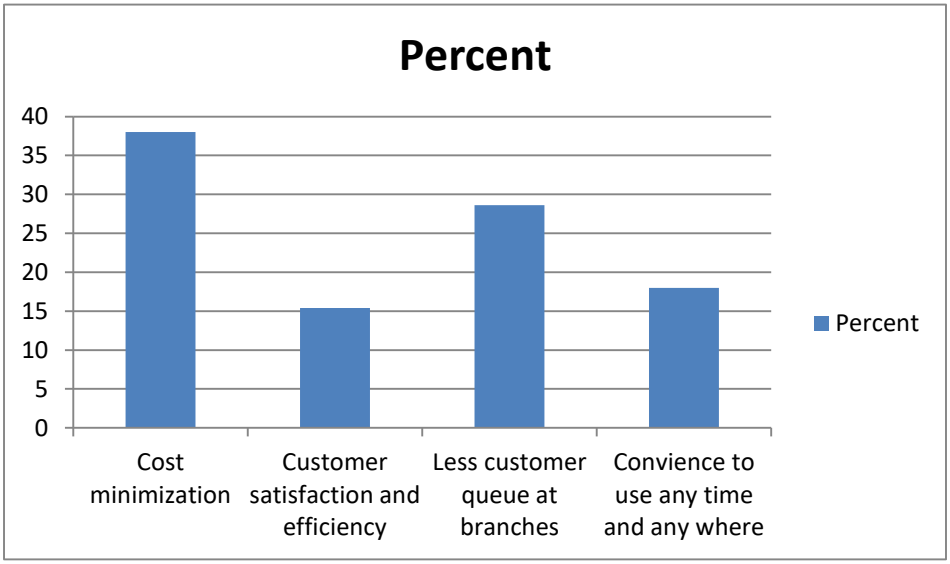


Table 12 and Figure 2 both display the benefits of digital banking and out of the total responses, 38% expressed cost minimization as one benefits of digital transaction, and 15.4% of the respondents mentioned that customer satisfaction and efficiency were the other benefits

of digital banking. 28.60% and 18% of the respondents expressed the benefits of digital banking as queue reduction at bank branches and the convenience of using it anytime and anywhere, respectively. The largest portion of respondents (38%) agreed that cost minimization was one of the benefits of digital banking.

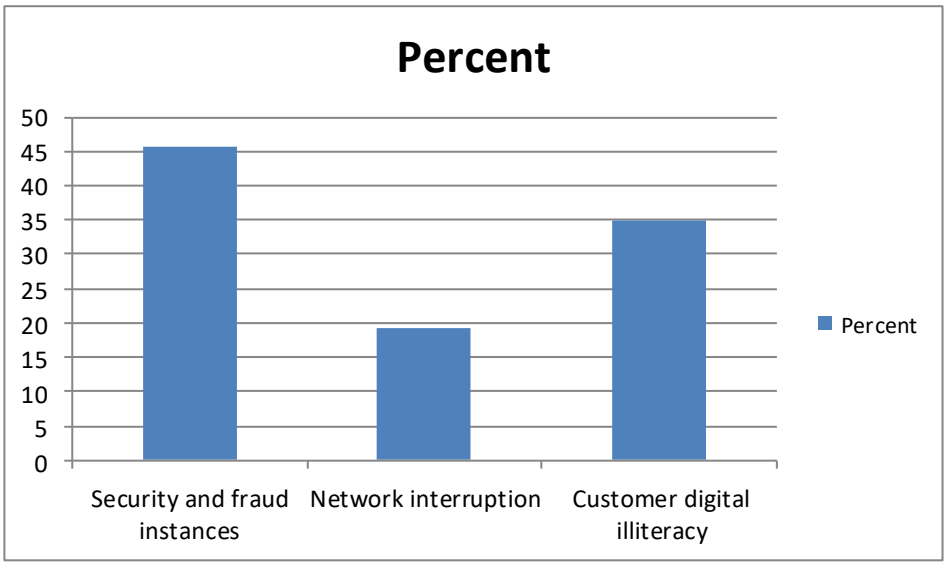
4.4.2. Challenges of Digital banking at CBE

Bank employees who respond to this survey were requested to identify the challenges that the CBE and its customers are facing now days due to digital banking and it is described as follow. As it is shown in below Table 13 and Figure 3, of all respondent 45.7% of the respondents mentioned out that security and fraud instances as a the major challenges of CBE as the bank and customers are suffering from identity theft and money stealing by hackers. 19.4% of respondents stated that the Network interruption is another challenges of CBE and its customers. Out of the total respondents 34.9% of the respondents mentioned out that customer's digital illiteracy are the second biggest challenges of digital banking at CBE.

Table 13:Challenges of Digital Banking

Challenges of Digital banking at CBE	Percent	Cumulative Percent
Security and fraud instances	45.7%	45.7%
Network interruption	19.4%	65.1%
Customer digital illiteracy	34.9%	100%
Total	100%	

Figure 2:Challenges of Digital banking at CBE



4.5. Correlation Analysis between fintech dimensions and bank profitability

Correlation analysis was conducted to explore the relationship between fintech dimensions and bank profitability. This analysis unveiled the associations among ATM, Mobile Banking, Internet Banking, Point of Sale (POS), CBEBirr, Electronic Fund Transfer (EFT), and Bank profitability. Pearson correlation analysis was employed to assess the extent of correlation among these variables.

A correlation matrix is a statistical tool utilized to assess the relationship between pairs of variables within a dataset. It consists of a table where each cell contains a correlation coefficient, typically ranging from -1 to 1. A correlation coefficient of 1 indicates a strong positive relationship between variables, 0 suggests no relationship (neutral), and -1 represents a strong negative relationship. By examining these coefficients, analysts can discern the strength and direction of associations between various variables in the dataset.

As per Bougie and Sekaran (2019), correlations in the range of ±0.1 to ±0.29 are considered weak, correlations of ±0.30 to ±0.49 are deemed moderate, and correlations equal to or exceeding ±0.5 are considered strong. These guidelines help interpret the strength of the relationship between variables based on their correlation coefficients.

The Pearson correlation method is employed to assess correlations among variables and identify those with strong correlations. In Table 14 above, all financial technology dimensions exhibit a robust and positive relationship with profitability, significant at the $p<0.01$ level. According to the correlation matrix in Table 14, the six independent variables show a significant and positive correlation with the dependent variable (profit). Mobile Banking demonstrates the strongest association with profit among the independent variables, with a correlation coefficient of 0.840 ($p<0.01$). Additionally, the association between ATM and Electronic Fund Transfer emerges as the strongest among the independent variables, with a correlation coefficient of 0.823 ($p<0.01$). Generally, all independent variables are positively correlated with the dependent variable, with statistical significance at $p<0.01$.

While correlation coefficients don't indicate causality between variables, we can enhance our understanding by squaring the correlation coefficient (known as the coefficient of determination, R^2). This measure quantifies the proportion of variability in one variable explained by another. In the following section, we'll delve into the relationship between

correlation coefficients and coefficients of determination, R^2.

Table 14: Correlation matrix of Fintech variables and Bank Profit

	Coefficient Type	ATM	MB	IB	POS	CBEBirr	EFT	profit
ATM	Pearson Correlation	1	.689**	.650**	.652**	.645**	.823**	.658**
	Sig. (2-tailed)		0.000	0.000	0.000	0.000	0.000	0.000
MB	Pearson Correlation	.689**	1	.774**	.763**	.723**	.750**	.840**
	Sig. (2-tailed)	0.000		0.000	0.000	0.000	0.000	0.000
IB	Pearson Correlation	.650**	.774**	1	.765**	.724**	.720**	.834**
	Sig. (2-tailed)	0.000	0.000		0.000	0.000	0.000	0.000
POS	Pearson Correlation	.652**	.763**	.765**	1	.764**	.703**	.750**
	Sig. (2-tailed)	0.000	0.000	0.000		0.000	0.000	0.000
CBEBirr	Pearson Correlation	.645**	.723**	.724**	.764**	1	.739**	.741**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000		0.000	0.000
EFT	Pearson Correlation	.823**	.750**	.720**	.703**	.739**	1	.748**
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000		0.000
profit	Pearson Correlation	.658**	.840**	.834**	.750**	.741**	.748**	1
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	
	N	350	350	350	350	350	350	350

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

Pearson variables correlation guideline for strength and association

Correlation	**Strength of correlation**
r = 0.10 to 0.29 or r = -0.10 to -0.29	Weak
r = 0.30 to 0.49 or r = -0.30 to -0.49	Moderate
r = 0.50 to 1.00 or r = -0.50 to -1.00	Strong

4.6. The effect of financial technology on Bank profitability

Regression analysis is a statistical tool utilized to ascertain the extent to which bank profitability is accounted for or explained by fintech variables. By employing regression, researcher can identify and quantify the relationship between bank profitability (the dependent variable) and various fintech dimensions (the independent variables). This analysis helps to uncover the

specific impact of fintech on bank profitability and can aid in making informed decisions regarding the adoption and utilization of fintech strategies within the banking sector.

4.6.1. Regression

The researcher has conducted a data cleaning process before performing regressions to ensure that all data are accurately inputted into SPSS and that no outliers are present, as outliers can significantly affect the analysis outcome and violate the assumption of normality. Regression analysis serves two main purposes in this study: prediction and causal inference. Specifically, regression analysis is utilized to determine the extent to which the independent variables explain the dependent variable and to understand the influence of each independent variable (ATM, MB, IB, POS, CBEBirr, and EFT) on the dependent variable, which is profit.

4.6.2. Assumptions

Regarding assumptions, ensuring that the data being analyzed are suitable for linear regression is crucial. Linear regression should only be applied if the data meet four key assumptions necessary for the model to yield meaningful results. It's essential to verify these assumptions, and SPSS statistics can be utilized for this purpose. The linearity assumption should be checked first before moving on to assess other assumptions.

4.6.2.1. Multicollinearity Analysis

Before conducting the regression analysis, the researcher assessed whether multicollinearity was present. Multicollinearity occurs when there is a strong correlation among the independent variables or predictors. This can result in shared predictive power or "overlap" among the independent variables. Multicollinearity was evaluated using tolerance and variance inflation factors (VIF). Tolerance values closer to 1 and VIF values less than 10 typically indicate acceptable levels of multicollinearity. Identifying and addressing multicollinearity is crucial to ensure the reliability and validity of the regression results.

Table 15 : Multicollinearity Statistics

Model	**Collinearity Statistics**	
	Tolerance	**VIF**
ATM	0.308	3.25
Mobile Banking	0.285	3.514
Internet Banking	0.303	3.302
POS	0.289	3.457
CBEBirr	0.319	3.134
EFT	0.227	4.412

Based on Table 15, tolerance values for all independent variables are greater than 0.10, indicating that each variable's variability not explained by other variables in the model is sufficiently high. This suggests that there is no multicollinearity issue concerning tolerance.

Additionally, the Variance Inflation Factor (VIF) measures the influence of correlations among independent variables on the precision of regression estimates.

VIF values should ideally not exceed 10 and should be close to one. According to Table 15, the VIF values for all independent variables are less than 10, indicating that multicollinearity is not a problem. Therefore, based on both tolerance and VIF values, there is no evidence of multicollinearity among the independent variables in the regression analysis.

4.6.2.2. Linearity

The linearity assumption in regression analysis posits that a linear relationship exists between the predictor variables and the outcome variable. This means that both the dependent variable and each independent variable must demonstrate a linear relationship. To visually verify this assumption, scatterplots are created between the independent and dependent variables.

In this study, scatterplots were generated to examine the relationship between financial technology variables and bank profit, aiming to identify any linear patterns. The scatterplot presented in Figure 4 suggests a linear relationship between financial technology and bank profit.

Additionally, in regression analysis, a potential indicator of nonlinearity is when the standard deviations of the residuals exceed those of the dependent variable. The residual statistics in Table 16 show that the standard deviation of the dependent variable is greater than that of the residuals. This suggests a linear relationship between financial technology variables and profitability.

Overall, based on the scatterplot analysis and residual statistics, it can be concluded that there is a linear relationship between financial technology variables and bank profitability, satisfying the linearity assumption of regression analysis.

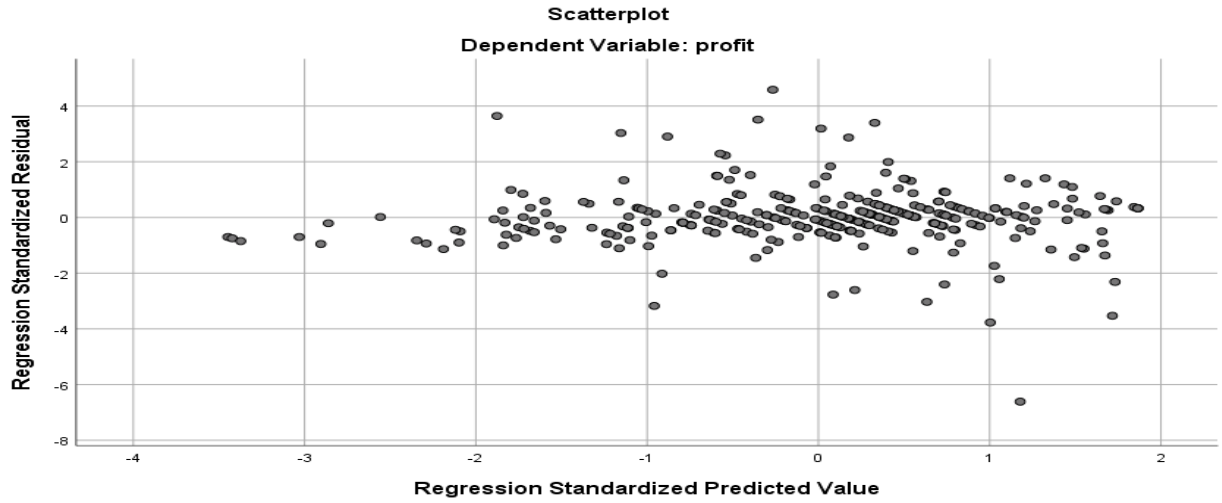
Table 16: Residual Statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1.2409	4.8868	3.6069	.68637	350
Residual	-2.27270	1.57599	.00000	.34069	350
Std. Predicted Value	-3.447	1.865	.000	1.000	350
Std. Residual	-6.613	4.586	.000	.991	350

a. Dependent Variable: profit

Source: survey own,2024

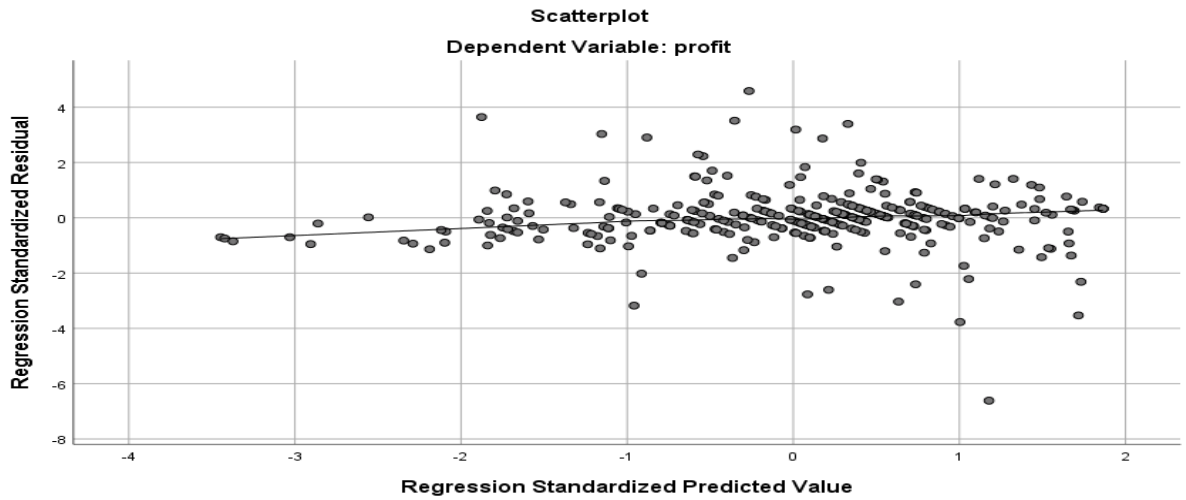
Figure 3: Scatter plot



4.6.2.3. Homoscedasticity

Prior to conducting a multiple regression analysis, it's important to check for homoscedasticity. This ensures that the residuals (the differences between the expected and observed values of the dependent variable) are normally distributed and exhibit a constant variance. Homoscedasticity means that the variances along the line of best fit remain consistent as you move along the line. Therefore, Figure 5 serves to illustrate the homoscedasticity of the variables, confirming that the assumptions of constant variance across the regression line are met.

.**Figure 4**: Scatterplot for Homoscedasticity



Source:own Survey,2024

4.6.2.4. Testing for Normality

Assessing the normality of data is essential for many statistical tests, as normality is a key assumption in parametric testing. There are two primary methods to evaluate normality: graphically and numerically. These approaches fall into two categories: statistical tests and visual inspection. Statistical tests provide an objective assessment of normality but may be less sensitive with small sample sizes and overly sensitive with large sample sizes. Consequently, some statisticians prefer to use their experience to subjectively judge normality through plots and graphs. While graphical interpretation allows for good judgment in cases where numerical tests may be too sensitive or not sensitive enough, it lacks objectivity. If you are not experienced in interpreting normality graphically, it is advisable to rely on numerical methods.

In statistical analysis, assessing the normality of data is crucial for many tests, as parametric tests often depend on this assumption. This is especially important in statistical tests such as linear regression analysis. However, it is the errors of the model, rather than the data itself, that need to be normally distributed.

The normality of the model's errors can be evaluated both graphically and analytically. A common analytical method involves examining descriptive statistics for skewness and kurtosis, with values between -2 and +2 generally considered acceptable to indicate a normal distribution.

As shown in Table 17, the skewness and kurtosis statistics for financial technology and profit fall within the acceptable range of -2 to +2. This suggests that the assumption of normal distribution is met, according to the guidelines established by George and Mallery (2010). Therefore, the data satisfies the normality assumption required for regression analysis.

Figure 6, accompanied by the histogram of standardized residuals, offers further support for the previously discussed numerical normality test. For the error terms to be normally distributed, which is crucial for regression analysis and many other statistical methods, the histogram should ideally resemble a normal curve.

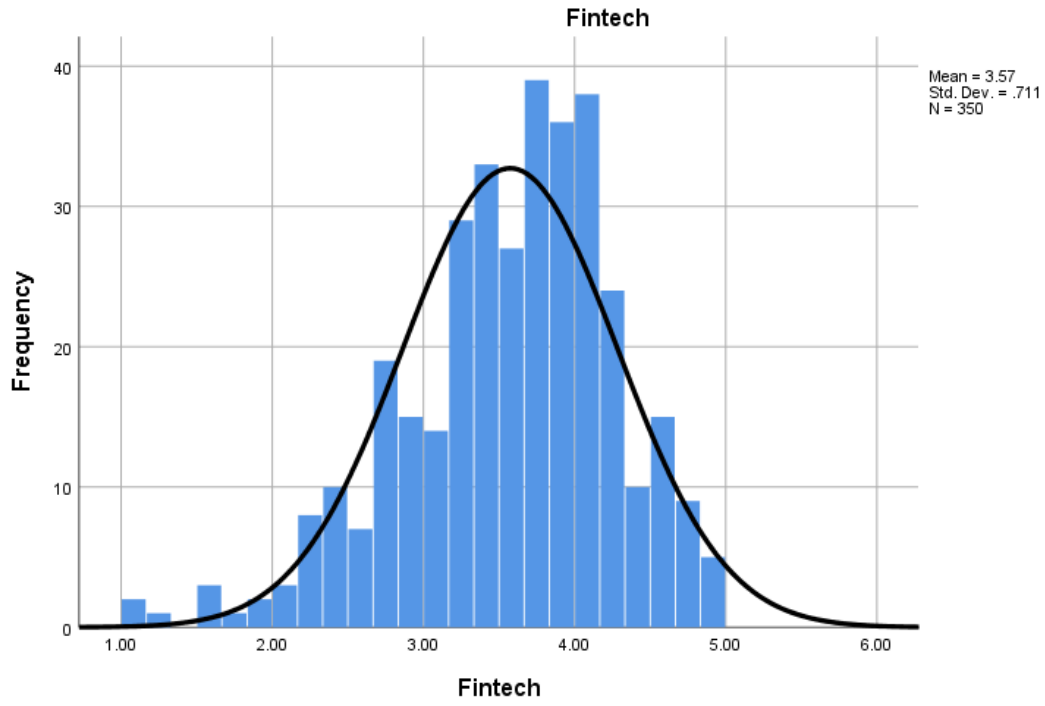
Figure 6 displays a histogram of standardized residuals that approximates a normal curve, visually confirming that the assumption of normally distributed errors is satisfied. This validation strengthens the validity of the regression analysis results and bolsters the reliability of the conclusions drawn from the model.

Table 17: Descriptive Statistics Skewness and kurtosis

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
ATM	350	-.551	.130	.191	.260
Mobile Banking	350	-.700	.130	.440	.260
Internet Banking	350	-.665	.130	.723	.260
POS	350	-.694	.130	.799	.260
CBEBirr	350	-.548	.130	.181	.260
EFT	350	-.586	.130	.407	.260
profit	350	-.769	.130	.867	.260
Valid N (listwise)	350				

Source: own survey, 2024

Figure 5: Test for Normality



4.7. Multiple regression of financial technologies on bank profitability

Multiple regression analysis enables the examination of the effect of multiple explanatory variables on a particular outcome of interest. It assesses the relative impact of these independent

variables on the dependent variable while holding all other variables constant. Essentially, multiple regressions extend the principles of simple linear regression to scenarios where we aim to predict a variable based on the values of two or more other variables.

In this context, the variable we seek to predict is termed the dependent variable, outcome variable, target variable, or criterion variable. Conversely, the variables utilized to predict the value of the dependent variable are referred to as independent variables, predictor variables, explanatory variables, or regressor variables.

.In the scenario described, multiple regressions could be employed to ascertain whether bank profit can be forecasted based on factors such as ATM usage, Mobile Banking adoption, Internet Banking utilization, Point of Sale (POS) transactions, CBEBirr transactions, and Electronic Fund Transfer (EFT) activity. Moreover, multiple regression facilitates the assessment of the overall fit or variance explained by the model, as well as the relative contribution of each predictor variable to the total variance explained.

Furthermore, multiple regression analysis allows for the testing of hypotheses established by the researcher. In this case, all six hypotheses initially formulated can be evaluated using the multiple regression models. Through this analytical approach, researchers gain insights into the relationships between variables and can make informed decisions based on the findings.

Table 18: Model Summery

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.896[a]	.802	.799	.34366

a. Predictors: (Constant), EFT, POS, Internet Banking, CBEBirr, ATM, Mobile Banking
Source: Own Survey, 2024

The model summary presented in Table 18 provides insight into the strength of the relationship between the independent variable (financial technology) and the dependent variable (bank profit). Within this table, the R value signifies the Pearson correlation between predicted values and actual values of the dependent variable, yielding a value of 0.896.

Furthermore, R^2, the multiple correlation coefficient, represents the proportion of variance in the dependent variable (i.e., bank profit) explained by the combination of six independent variables related to financial technology (ATM, Mobile Banking, Internet Banking, Point of Sale (POS), CBEBirr, and Electronic Fund Transfer). In this instance, the R^2 value of 0.802 indicates that approximately 80.20% of the variance in bank profit is accounted for by these six predictors.

This implies that a substantial portion of the variability in bank profit can be predicted from the information provided by these independent variables.

Table 19: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	164.417	6	27.403	232.025	.000[b]
	Residual	40.509	343	.118		
	Total	204.926	349			

Source: Own Survey, 2024

a. Dependent Variable: profit b. Predictors: (Constant), EFT, POS, Internet Banking, CBEBirr, ATM, Mobile Banking

The ANOVA (Analysis of Variance) provides insights into whether the overall model yields a statistically significant level of prediction for the outcome variable (Field, 2005). The ANOVA table breaks down the total variation in the dependent variable into two main components: regression and residual (error). Regression represents the variability in the dependent variable that is explained by the regression model. It quantifies how well the independent variables collectively predict the dependent variable. Residual (Error)t accounts for the variability in the dependent variable that is not explained by the regression model. It captures the discrepancy between the observed values of the dependent variable and the values predicted by the regression equation.

The F-ratio, a test statistic derived from ANOVA, determines whether the model collectively possesses significant predictive capability, accounting for the number of variables included in the model.

In this context, the significance result in Table 19 of P-value 0.000 indicates a p-value less than 0.05, suggesting statistical significance. Additionally, with the regression mean square exceeding the residual mean square and an F-value of 232.025, it signifies that the regression model demonstrates a good degree of prediction. Therefore, based on the ANOVA results, it can be concluded that the regression model fits well and provides a significant level of prediction for the outcome variable.

Table 20: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta				
1	(Constant)	.329	.099		3.342	.001	0.308	3.25
	ATM	-.038	.042	-.040	-.919	.359	0.285	3.514
	Mobile Banking	.338	.039	.391	8.697	.000	0.303	3.302
	Internet Banking	.370	.043	.372	8.531	.000	0.289	3.457
	POS	.027	.045	.027	.608	.543	0.319	3.134
	CBEBirr	.091	.038	.101	2.385	.018	0.227	4.412
	EFT	.123	.049	.126	2.490	.013	0.308	3.25

a. Dependent Variable: profitability Source: Own Survey, 2024

The β values in Table 20 indicate the relationship between bank profit and each predictor variable. A positive β value signifies a positive relationship between the predictor and the outcome, while a negative coefficient indicates a negative relationship. Based on the β values presented in Table 20, five predictors exhibit positive coefficients, suggesting a positive relationship with bank profit. Conversely, one predictor displays a negative β coefficient, indicating a negative relationship.

Therefore, it can be inferred from the β values that five independent variables have a positive association with bank profit. The unstandardized coefficient β value indicates the magnitude of influence or effect of each financial technology variable on profit. A higher β value implies a stronger influence of the independent variable on the dependent variable.

According to Table 20, Internet Banking possesses the highest β value of 0.370, indicating that it has the greatest effect on bank profit among all independent variables. This suggests that, assuming other independent variables remain constant, a one-unit increase in Internet Banking could lead to a 0.370 increase in bank profit. Mobile Banking follows with the second-highest β value of 0.338, suggesting that a one-unit increase in Mobile Banking, holding other variables constant, could result in a 0.338 increase in bank profit.

Additionally, other variables such as POS, CBEBirr, EFT, and ATM exhibit β values of 0.027, 0.091, 0.123, and -0.038, respectively. The negative β value for ATM (-0.038) suggests that a one-unit increase in ATM usage, with other variables held constant, may lead to a decrease in bank profit by 0.038.

The multiple regression equation can be formulated as follows:

Profit(Y) = 0.329 - 0.038(ATM) + 0.338(MB) + 0.370(IB) + 0.027(POS) + 0.091(CBEBirr) + 0.123(EFT) + εi

In this equation, Profit represents the dependent variable, β0 represents the constant term, and β refers to the regression coefficients associated with each independent variable (ATM, MB, IB, POS, CBEBirr, and EFT). The error term εi represents the difference between the predicted and observed values of profit.

Thus, the econometric model suggests that the level of profitability in the Commercial Bank of Ethiopia depends on ATM usage, Mobile Banking, Internet Banking, Point of Sale transactions, CBEBirr transactions, Electronic Fund Transfer, and εi.

4.8. Hypothesis Testing

Hypothesis testing often referred to as significance testing, is a statistical procedure used by analysts to examine assumptions about a population parameter. The approach taken by the analyst depends on the type of data and the purpose of the analysis.

The purpose of hypothesis testing is to evaluate the plausibility of a hypothesis using sample data. In this research, the researcher initially proposed six hypotheses to be tested.

Out of these six hypotheses, five (H2, H3, H4, H5, H6) exhibit a positive β value for their predictors, indicating a positive relationship between the independent variables and bank profit.

H1: ATM has a positive and significant impact on bank profitability.

The regression analysis results (Table 20) reveal a negative and statistically insignificant effect of automated teller machines (ATM) on bank profitability at the $p < 0.05$ level. The p-value associated with the predictor in Table 20 is 0.359, which exceeds the significance threshold of 0.05. Consequently, the study rejects H1 due to its lack of statistical significance.

H2: Mobile Banking has a positive and significant effect on bank profitability.

The regression analysis results, as displayed in Table 20, indicate that mobile banking exhibits a positive and statistically significant impact on bank profitability at the $p < 0.05$ level. Specifically, the regression output in Table 20 demonstrates a significant p-value of 0.000, which is below the 0.05 threshold. As a result, the study does not reject H2; instead, it accepts H2, suggesting that mobile banking indeed has a significant positive effect on bank profitability.

H3: Internet Banking has a positive and a significant effect on bank profitability.

The outcome of the regression analysis, as presented in Table 20, reveals that Internet banking has a positive and statistically significant impact on bank profitability at the $p < 0.05$ level. This is evident from the significance value displayed in the table, which is recorded as 0.00, indicating a value lower than 0.05. Consequently, the study does not reject H3; instead, it accepts H3, suggesting that Internet banking has a significant positive effect on bank profitability.

H4: Point of Sales (POS) has a positive and significant effect on bank profitability.

The regression analysis, presented in Table 20, indicates that the point of sale (POS) has a positive impact on bank profitability. However, this impact is not statistically significant according to the p-value, which is 0.543, exceeding the standard threshold of 0.05. Consequently, the study rejects the hypothesis (H4) that POS significantly affects bank profitability, as the evidence doesn't support this assertion.

H5: CBEBirr has a positive and a significant effect on bank profitability.

In Table 20, the regression analysis outcome indicates that CBEBirr exhibits a positive and statistically significant impact on bank profitability, evident from the significance value of 0.018, falling below the 0.05 threshold. Consequently, the study doesn't reject H5; instead, it accepts it, as the data supports the hypothesis that CBEBirr has a significant effect on bank profitability.

H6: Electronic Fund Transfer has a positive and a significant effect on bank profitability.

According to the regression analysis presented in Table 20, electronic fund transfers (EFT) demonstrate a positive and statistically significant impact on bank profitability, as indicated by the significance value of 0.013, which is below the 0.05 threshold. Consequently, the study does not reject H6; instead, it accepts it, confirming the hypothesis that EFT has a significant effect on bank profitability.

Discussions

The overall findings of the study suggest that the various dimensions of financial technology significantly influence bank profitability. However, as demonstrated in Table 10, two predictors, namely ATM and POS, did not show a significant impact on bank profitability. This aligns with previous research by Hiyam S. and Boutheina H. (2017), which found that dimensions like banking, internet banking, CBEBirr, and electronic fund transfer positively and significantly affect bank profitability. Similarly, Hani El Chaarani (2018) conducted a study on how technological innovation impacts bank performance, revealing that advancements in software, ATMs, internet, mobile, and online banking contribute to better bank performance. The study also highlights that financial innovations such as mobile banking, internet banking, and ATMs enhance the efficiency and profitability of Lebanese banks. Recent studies by Kou et al. (2021), Cho & Chen (2021), and Wang et al. (2021) further support the positive impact of investing in financial technology on profitability. This positive effect can be attributed to the reduction in information access and operating costs. Importantly, the fintech system significantly aids companies in lowering their operating costs, thereby enhancing profitability. Additionally, Wang et al. (2021) suggest that fintech improves risk control, profitability, and reduces the cost of financial services.

Similarly, a study conducted by Yosef K. (2017) found a strong correlation between the financial performance of CBE and various digital banking services such as internet banking, automatic teller machines, point of sale, and mobile phone banking. Likewise, Muhamad H. et al. (2021) employed panel data regression analysis, with automated teller machine (ATM) transactions, internet banking, and mobile banking as independent variables, and return on assets (ROA) as the dependent variable. The findings indicated a positive and significant impact of internet and mobile banking on profitability, while ATM technology showed no effect.

Descriptive statistics from open-ended questions revealed insights into the perceptions of participants regarding digital banking. 38% of respondents acknowledged that digital banking offers significant advantages in cost reduction through automated and paperless transactions without requiring employee intervention. Moreover, 28.6% of participants noted that digital banking notably reduces queues at bank branches. Responses to open-ended questions in Table 13 highlighted that 45.7% of respondents identified hacker fraud as the primary issue faced by

CBE and its clients. Additionally, 34.9% of respondents emphasized customers' lack of digital literacy as the second-largest challenge for CBE in relation to digital banking.

Table 21: Summery of Hypotheses Test

Hypothesis	Statement of Hypothesis	Method of analysis	Result
H1	H1:ATM has a positive and significant effect on Bank profitability	Multiple regression	Reject
H2	H2: Mobile Banking has a positive and significant effect on Bank profitability	Multiple regression	Support
H3	H3: Internet Banking has a positive and significant effect on bank profitability	Multiple regression	Support
H4	H4: POS has a positive and insignificant effect on Bank profitability	Multiple regression	Reject
H5	H5: CBEBirr has a positive and significant effect on bank profitability	Independent t-test	Support
H6	H6: EFT has a positive and significant effect on bank profitability	Independent t-test	Support

Chapter V: Summary, Conclusion and Recommendation

5.1. Summary

The primary goal of the study is to analyze the impact of financial technology on the profitability of CBE. This was accomplished through a descriptive and explanatory research methodology. A total of 392 questionnaires were distributed across 20 branches of CBE in Addis Ababa. Among these, 350 properly filled-out questionnaires were returned by bank employees. The demographic characteristics including gender, age, educational background, work experience, and job position of the respondents were analyzed to provide an overview of the sample. Data collection was facilitated by a structured questionnaire administered to CBE employees, allowing the researcher to gather the necessary information and evaluate the influence of financial technology on bank profitability.

5.2. Conclusion

Multiple correlations were conducted to examine the relationship between fintech dimensions and bank profitability. The correlation matrix revealed that all fintech dimensions exhibited a positive and significant correlation with bank profitability, with correlation coefficients ranging from 0.645 to 0.840. This suggests that as fintech dimensions perform better, bank profitability also tends to improve, and vice versa. Additionally, multiple regression analysis was performed to assess the extent to which independent variables influence and predict variations in the dependent variable. The regression model summary showed that the R-squared (R2) value indicated that 80.2% of the variance in bank profitability can be predicted by the independent variables.

The regression coefficient table further indicated that among the six fintech dimensions, Internet Banking emerged as the strongest predictor, with a β value of 0.370, indicating a greater influence on bank profitability compared to other dimensions. Conversely, ATM showed a negative impact on bank profit, with a β value of -0.038, possibly due to the acquisition costs associated with ATMs. Previous theories and studies in financial innovation have consistently demonstrated a positive association between fintech and bank profitability, suggesting that the implementation of more fintech or financial innovations is likely to enhance bank profit.

The study also revealed that the adoption of digital finance technologies contributes to cost reduction by automating tasks previously handled by bank employees. Additionally, digital finance technology has reduced the time customers spend on sending and receiving money, as these operations are now seamlessly conducted through mobile banking or internet banking platforms. These factors likely contribute to CBE's improved profitability. Overall, the findings of the study support the notion that fintech or digital banking can enhance cost efficiency, ultimately leading to increased profit.

In responses to open-ended questions, respondents highlighted the main benefits of digital banking as cost reduction and the convenience of accessing digital banking services from anywhere and at any time. These features diminish the necessity for clients to physically visit bank branches and lower transaction costs. However, respondents also identified significant challenges for digital banking operations in CBE, including fraud by hackers and customer digital illiteracy, which are major hurdles faced by CBE in current times.

5.3. Recommendation

By implementing these recommendations, CBE can harness the full potential of fintech to achieve cost reduction, operational efficiency, and ultimately, improved bank profitability. The findings of the study show that Internet banking and mobile banking have the greatest influence on bank profitability. Hence, CBE should focus on strengthening Internet banking and mobile banking, as they have the potential to increase bank profitability. As the study indicates, CBE should pay attention to enhancing and increasing POS users or customers to boost bank profitability, as POS currently has the lowest effect on bank profitability. It is encouraging to learn that CBE organizes digital banking services at the vice president level in its organizational structure, indicating a high priority. However, this alone is not sufficient; CBE should regularly revise its digital strategy to keep up with the dynamism of digitalization, and more investment is required to expand digital banking in order to maximize the return on financial innovations.

It is recommended that CBE make every effort to reduce or eliminate client account identity theft, which has resulted in hackers stealing money from customer accounts. Many bank customers are currently complaining that their personal money has been stolen by hackers across

multiple branches, which is a highly concerning situation. As a result, CBE must implement stringent security measures to prevent fraud and other misconduct that can result in significant financial losses for bank customers. Given its significant positive impact on bank profitability, CBE should prioritize and further invest in Internet banking infrastructure and services. This may involve improving the user experience, expanding service offerings, and ensuring robust security measures to foster customer trust and usage. Even if ATMs showed a negative impact on bank profit, efforts should be made to optimize their usage and minimize associated costs. This may involve the strategic placement of ATMs, leveraging partnerships to share ATM networks, and exploring innovative solutions to reduce acquisition and maintenance expenses.

Addressing customer digital illiteracy is crucial for the successful adoption and utilization of digital banking services. CBE should implement educational initiatives and user-friendly resources to enhance customers' digital skills and confidence in using digital banking platforms. This approach also helps in reducing digital illiteracy and, in the meantime, raises customer awareness, which eventually makes customers wiser and smarter in protecting themselves from identity theft and hackers. It is recommended to continuously evaluate and streamline internal processes to maximize efficiency and minimize operational costs. Automation of routine tasks, optimization of resource allocation, and leveraging data analytics can help CBE achieve operational excellence and cost savings.

Capitalizing on the convenience and accessibility of mobile banking by expanding its functionalities and promoting its usage among customers is essential. This may involve introducing innovative mobile banking features, incentivizing mobile banking adoption, and ensuring seamless integration with other digital banking channels. Prioritizing customer needs and preferences in the development and enhancement of fintech solutions is crucial. Soliciting feedback, conducting market research, and tailoring digital banking services to meet the evolving demands of customers will foster satisfaction, loyalty, and increased usage.

5.4. Limitation and Future studies

This research is conducted with limited access to secondary data. The study focused on the perception of workers on impact of financial technology on bank profitability at the Commercial Bank of Ethiopia, using CBE employee opinions as its primary source. The study focused

primarily on branches in Addis Abeba, and fintech is represented by six dimensions. As a result, it is recommended that future studies should consider bank branches outside of Addis Abeba, as well as other dimensions of fintech such as agent banking and debit/credit cards. Furthermore, future studies should investigate the impact of fintech on bank profitability by considering all Commercial Bank of Ethiopia branches across the country plus all private banks into account. Expanding the scope of the analysis to include the broader banking sector, rather than just a single institution, would provide a more comprehensive understanding of how financial technology is affecting the overall profitability and competitiveness of the commercial banks in banking industry.

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APPENDIX

Addis Ababa University College of Business & Economics

Department Of Economics

Financial Economics Post Graduate Program

Questionnaires to be filled out by Bank Employees

Dear Respondent,

I am a post graduate student of Financial Economics at College of Business and Economics and conducting a research on "Perception of workers on Impact of Financial Technologies on Bank Profitability". The questionnaire will be used for research paper which is a partial fulfillment of the requirements for the degree of M.S in Financial Economics. The objective of this questionnaire is to assess the Impact of Financial Technologies on Bank's Profitability.

Therefore, I would like assure you that your responses will be used for academic research purpose only and shall be kept confidential.

Instruction on how to fill out the questionnaire.

Please read each statement carefully and put the tick (√) mark under the choice and no need of writing your name.

Part I. Demographic Information (please tick (√) mark)

1. Please indicate your Gender ☐ Male ☐ Female

2. Age Group ☐ 18-25 ☐ 26-35 ☐ 36-45 ☐ 46-55 ☐ 56 and above

3. Educational Level ☐Certificate ☐ Diploma ☐ First Degree

☐ M.A/M.Sc. ☐ Ph.D. degree others, please specify……..

4. How long you have been working in banking sector ☐ <5 years ☐ 5-10 years ☐ >10years

5. Your position in the Bank

☐ Officer ☐ Senior-officer ☐ Manager ☐ Director

5. Technologies based financial service that is provided at your respective branch (it is possible to tick more than one) ☐ ATM ☐ Mobile Banking ☐ Internet Banking ☐ POS

☐ Mobile Wallet ☐ Electronic Fund Transfer

Part II. Bank employees' opinion on impact of financial technologies on bank's Profitability

Please indicate on a five point scale the extent to which you agree/disagree with the following statements by ticking the appropriate answers on the box in the columns.

1= Strongly disagree, 2= Disagree, 3= Neutral, 4=Agree, 5= Strongly Agree

1	**Automated Teller Machine (ATM)**	**1**	**2**	**3**	**4**	**5**
1.1	ATMs have had a positive effect of increasing commission fee based income					
1.2	ATMs have expanded the income generating potential of the bank					
1.3	ATMs have low maintenance costs leading to high levels of profitability over their economic lifetime					
1.4	ATMs influence reduction of operational costs and hence better return on assets for the bank(profitability)					
1.5	24 Hrs a day,7 days a week and 365 days a year availability of ATM service makes positive contribution to CBE profitability					
2	**Mobile Banking (MB)**	**1**	**2**	**3**	**4**	**5**
2.1	Incomes from mobile banking have had positive impact on bank income margins					
2.2	Income from mobile banking has high margin hence contributing positively to bank annual profitability					
2.3	Mobile banking application has low maintenance costs leading to high levels of profitability over their economic lifetime					
2.4	Mobile banking has expanded the income generating potential of the bank					
3	**Internet Banking(IB)**	**1**	**2**	**3**	**4**	**5**
3.1	Internet banking has a positive effect of increasing commission fee based income					
3.2	Internet banking has expanded the income generating potential of the bank					
3.3	Income from Internet Banking has high margin hence contributing positively to bank profitability					
3.4	Use of internet services has added to more profitable business avenues to the bank					
3.5	Use of internet services has increased customers access to bank services					

4	Point of Sales (POS	1	2	3	4	5
4.1	POS terminals have had a positive effect of increasing income of the Bank					
4.2	POS terminals investments have payback period of less than 3years and hence good return on assets					
4.3	Income from POS terminals has high margin hence contributing positively to bank annual profitability					
4.4	POS terminals have low maintenance costs leading to high levels of profitability over their economic life time					
4.5	Transactions conducted through POS contributes to Bank profitability					
5	**Mobile Wallet (CBE Birr)**	**1**	**2**	**3**	**4**	**5**
5.1	Adoption of CBE Birr wallet banking products and services reduce the cost of handling transactions by					
5.2	Adoption of CBE Birr wallet is helping to have more bank customers who want to conduct bill payment transactions via CBE birr					
5.3	Adoption of CBE Birr wallet reduces the cost of handling cash and the risk of carrying cash.					
5.4	Adoption of CBE Birr wallet influence reduction of operational costs and hence better return on assets for the bank					
6.	**Electronic Fund Transfer (EFT)**	**1**	**2**	**3**	**4**	**5**
6.1	Electronic funds transfer has a positive effect of increasing commission fee based income					
6.2	Electronic funds transfer has expanded the income generating potential of the bank					
6.3	Incomes from electronic funds transfer have a positive impact on bank income margins					
6.4	Electronic funds transfer enables the bank to reduce stationary and transactions handling cost by making the transaction paperless					
6.5	Income from electronic funds transfer has high margin hence contributing positively to bank annual profitability					

7.	7. Bank Profitability	1	2	3	4	5
7.1	Investment in ATMs in mostly motivated by profits to the bank					
7.2	ATMs investments have payback period of less than 5 years and hence good return on assets					
7.3	Investment in Mobile Banking in mostly motivated by profits to the bank					
7.4	Internet banking influence reduction of operational costs and hence better return on assets for the bank					
7.5	POS terminals influence reduction of operational costs and hence better return on assets for the bank					
7.6	Adoption of CBE Birr wallet influence reduction of operational costs and hence better return on assets for the bank					
7.7	Electronic Fund Transfer influence reduction of operational costs and hence better return on assets fort					

Part III. Please answer the open ended questions freely.

1- What type of benefit or advantage has so-called fintech or digital banking brought to CBE?

_____
_____
_____
_____
_____

2- Do you think that fintech applications or digital banking have made CBE profitable and competent?

_____
_____
_____
_____

3- Please mention at least three challenges that CBE is facing due to adopting fintech or digital banking.

_____
_____
_____
_____