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The Effect of Digitalization on Financial Performance: The Case of Selected Commercial Banks in Ethiopia

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Statement of Declaration

I declare that the thesis entitled: The effect of digital banking on the financial performance: The case of selected commercial banks in Ethiopia, submitted for partial fulfillment of the requirements for the Degree of Master of Science in Accounting and Finance at Addis Ababa University, is my original work and has not been presented for the award of any degree in any other University or institution.

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Statement of Certification

This to certify that this thesis titled “The effect of digital banking on the financial performance: The case of selected commercial banks in Ethiopia” carried out by Dibora Bitwoded Feleke. The work is appropriate for the submission for the Master of Science Degree in Accounting and Finance.

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List of Abbreviations and Acronyms

ATM	Automated Teller Machine
CLRM	Classical Linear Regression Model
ICT	Information and Communication Technology
BOA	Bank of Abyssinia
CBE	Commercial Bank of Ethiopia
CLRM	Classical Linear Regression Model
E-banking	Electronic Banking
POS	Point-of -Sale
MW	Mobile Wallet
ROE	Return on Equity
ROA	Return on Asset
ROI	Return on Investment
MV	Mean Value
NBE	National Bank of Ethiopia
NDCU	Number of Debit Card Users
NMBU	Number of Mobile Banking Users
LOG	Logarithm
VATMT	Value of ATM Transactions
VPOST	Value of POS Transactions
VMBT	Value of Mobile Banking Transactions
VIBT	Value of Internet Banking Transactions

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Abstract

The banking sector in Ethiopia is a driving force in the country's economy, consisting of one state owned bank and 29 private commercial banks. This paper sought to offer understanding into how digitalization has influenced the performance of selected Commercial banks in Ethiopia by using return on equity as the indicator of financial performance. ROE (return on equity) is usually used to measure the performance of banks and is often regarded as an index of financial performance. The paper used secondary data, which was gathered from the head offices & annual reports of eight commercial banks which were selected by using purposive sampling method, covering the years 2022 to 2024. A causal research approach was used to identify the association among the different factors under study. In the study, the researcher tried to analyze how independent variables, which are digitalization services including number of debit card users, value of ATM transactions, value of POS transactions, number of mobile banking users, value of mobile banking transactions, value of internet banking transactions & bank size (control variable) affect financial performance. The researcher assumed that digital transformation has a positive effect on banks' financial performance. The data was analyzed by using the random effect regression technique with descriptive and correlation analyses conducted through the econometric software STATA version 15. The regression analysis indicated that from bank specific variables, value of ATM transactions and number of mobile banking users had a positive and significant effect on bank's performance as measured by return on equity which showed that an increase in these variables had a positive effect on the financial performance of commercial banks. Bank size, a control variable the researcher used also had a positive effect on the ROE.

Keywords

Digitalization; ATM; Commercial Banks; Internet banking; Mobile banking; POS; ROE

CHAPTER ONE

INTRODUCTION

This chapter begins with a brief introduction to the study's background, followed by a statement of the problem. It then presents the research objectives along with the general and specific objectives & the hypothesis of the study. Finally, the chapter discusses the significance of the study, the scope of the study and the limitations of the study and provides an overview of the paper's organization.

1.1 Background of study

Digitalization is the most significant technological trend which is changing society as well as business. In this day & age firms are always under pressure to use digital technologies and to adapt business models. Even though embracing digital technology yields many benefits, it also requires investments and related costs (Reis et al., 2020).

Digital financial services (DFS), such as mobile banking, internet banking, ATMs, agency banking, and POS devices, contribute significantly to promoting access to financial services in Ethiopia by extending services to communities with limited access & this digitalization of banking operations has resulted in increased efficiency and profitability of financial institutions by significantly optimizing operational expenses and increasing return on equity (Ethiopian Digital Finance Workshop, 2024).

Studies demonstrate that digital payments reduce costs and increase the ease of financial transactions & also increase financial inclusion by increasing the number of eligible account users. As the world is undergoing drastic digital transformations, Ethiopia has also joined this journey of transformation with full commitment to create a Digital Ethiopia by 2025 & for this a digital payment system is vital (Ahmed, 2021).

One of the major transformations in the Ethiopian banking sector is the digitalization of services. The usage of mobile phone is rapidly increasing, and internet access is also expanding and as a result banks in Ethiopia are progressively adopting digital channels to broaden the target demographic, especially in rural areas. The future of banking in Ethiopia is clearly inclining

towards digitalization. The government is making financial reforms with the growing number of oversea competitors, and the emergence of fintech as the country's banking sector is set for a substantial transformation. Digitalization will not only boost financial inclusion but also enhance efficiency, foster competition, and drive innovation. This evolving banking landscape offers substantial opportunities for growth and impact for both local and foreign investors (Taeme, 2024).

Digital transformation has become an essential strategic accomplishment for banks to be competent in the industry. Digital transformation has a driving effect on bank performance. From various viewpoints, strategic and management digitization promotes bank performance. Digital transformation promotes bank performance through increased revenue diversification and reduced credit risk & enhancing the construction of new digital infrastructure while activating the digital credit function can help digital transformation to improve bank performance. The digital transformation of banks that establish fintech subsidiaries has a more pronounced impact on improving performance while the digital transformation of rural commercial banks has a poor impact (Zhang et al., 2024).

Ethiopia has shown a rapid digital financial transactions growth since 2019 in terms of both volume and value of transactions across all channels, including ATM, POS, mobile banking, and internet banking. It is also indicated that as of June 2023, there was a report showing that digital payments worth more than Birr 4.7 trillion (equivalent of US $82 Billion) was made by end users in Ethiopia which is three times the value made in the previous year. The number of digital transactions reached 1.2 trillion where mobile money showed the greatest growth in number of transactions, with a six-fold increase in just one year, from 48 million transactions in 2022 to 298 million transactions in 2023 (Besrat, 2024).

ATMs are interconnected with international banking networks. International ATM cardholders can withdraw funds from any ATM machine of the 30 commercial banks operating in Ethiopia. ET Switch S.C., a share company owned by the commercial banks, was created to improve bank-to-bank integration. According to sources at ET Switch S.C., the service is used by over 10 million ATM card holders across the country. In 2021, Ethio Telecom, a publicly owned telecom and internet services providing company, launched an online payment

application called Telebirr. Telebirr allows users to deposit cash, send money, receive payments, and withdraw cash. Customers can also use Telebirr to buy airtime and packages, pay with Telebirr for utilities and traffic penalties; buy airtime; and pay for merchants. After two years of operations, Telebirr registered 34 million users and transacted over $12 billion. In 2023, Safricom's m-pesa mobile money application also became available in Ethiopia (Ethiopia-Country Commercial Guide, 2024).

Ethiopia is taking steps toward digital transformation by hoping to be able to achieve its development goals and foster economic advancement. The National Digital Transformation Strategy which is also known as 'Digital Ethiopia 2025', acts as the roadmap for Ethiopia's approach & a key element for this is the digital payment eco-system. The Digital Transformation Strategy brings a need for immediate action, stakeholder mobilization, and integration of the ongoing strategic efforts to develop the payments ecosystem and increase the access to financial services. The strategy, along with a gap assessment for digital economy stakeholder engagement, aligns with Ethiopia's national development vision and chief concern. The main goal is to elevate Ethiopia's digital readiness (Besrat, 2024).

In order to elevate digital readiness, there is a need to strengthen the existing infrastructure, including connectivity and power, developing enabling systems like digital ID, digital payments, and cybersecurity, and facilitating digital interactions between the government, the private sector, and citizens through e-government services and e-commerce platforms. Besides that, the strategy has a goal to strengthen the broader digital ecosystem to enhance the access to capital investment, human capital, and regulatory frameworks. The strategy indicates there should be an existence of sector-specific pathways to promote digital advancement in the modern economy. These pathways involve activating the potential of agriculture, advancing the global value chain in manufacturing, developing IT-enabled services, and utilizing digital technology to strengthen tourism competitiveness (Besrat, 2024).

Therefore, this research is conducted to determine the effect of on the financial performance of Commercial Banks in Ethiopia. It provides a significant perception of digital transformation for commercial banks and similar financial institutions.

1.2 Statement of Problem

Recently, the banking sector in Ethiopia has experienced a substantial transformation propelled by digitalization. The adoption of digital banking services, such as ATMs, mobile banking, internet banking, and agent banking, has transformed the way banks operate and engage with their customers. This swift advancement of digital technologies has profoundly changed the operational framework of the banking industry, offering both opportunities and challenges for banks. As Commercial Banks in Ethiopia adopt digitalization to improve their services, it is essential to understand the precise impact of these digitalization services on the financial performance of banks.

Although the Ethiopian banking sector is increasingly embracing digitalization, there is limited empirical evidence regarding its effects on the financial performance of commercial banks. While several previous studies have attempted to contribute to the understanding of how digitalization services impact the financial performance of commercial banks, and have proposed their implications, many of these studies are based in contexts that differ significantly from Ethiopia in many terms. There have been limited studies assessing the influence in relation to performance of banks in Ethiopia.

Hailu (2020) examined the role of e-banking on banks' performance in the country using ROA and ROE as a proxy & selected eight commercial banks operating in Ethiopia between 2014/2015 - 2018/2019 using secondary data and a purposive sampling technique to conduct the study. To assess the influence of digitalization on commercial banks' ROE & ROA, the number of ATM machines, the value of mobile banking users, the number of POS terminals, the value of ATM transactions, the value of POS transactions, the value of mobile banking transactions & the number of debit card issued were utilized as explanatory variables. The study's findings revealed that except mobile banking, most of e-banking services (POS & ATM banking) have a positive and significant relationship with financial performance as measured by the ROE, while the relationship between value of mobile & POS was found to be insignificant on ROA.

Girma (2019) evaluated the role of e-banking on commercial banks' economic performance in Ethiopia utilizing ROE as proxy. Ten commercial banks operating in Ethiopia between 2015-2018 were chosen by using purposive sampling technique and secondary data collected from

these banks was used. To assess the influence of digitalization on commercial banks' ROE, number of ATM terminals, number of debit cards, number of mobile banking users, value of ATM transactions, value of mobile banking transactions, bank size and inflation rate were used as explanatory variables. The study's findings revealed that the number of mobile banking users and the value of ATM transactions had a positive and significant effect on banks' profitability as measured by ROE which showed that the increase in the number of these variables resulted in an increase on the financial performance of commercial banks.

Therefore, the aim of this research is to examine the impact of digitalization on a key financial indicator, Return on Equity (ROE) by assessing factors such as number of debit card & mobile banking users, value of ATM & POS transactions, value of mobile banking & internet banking transactions & bank size as a control variable. By evaluating the impacts of these digital services on commercial banks' financial performance, this study has tried to provide profound understanding to the development of effective digitalization implications for commercial banks by including a new variable that wasn't included the previous studies, which is the value of internet banking transactions.

1.3 Research objectives

1.3.1. General Objective

This study primarily intended to explore digitalization effect on banks' financial performance in Ethiopia for the period between 2022 & 2024 by using ROE.

1.3.2. Specific Objective

1. To assess the impact of the number of debit card users on Return on Equity
2. To identify the impact of the value of ATM transactions on Return on Equity
3. To explore the impact of the value of POS transactions on Return on Equity
4. To assess the impact of the number of mobile banking users on Return on Equity
5. To examine the impact of mobile banking transactions on Return on Equity
6. To evaluate the impact of value internet banking transactions on Return on Equity

1.4 Research Hypothesis

H1: The number of debit card users has a positive and significant effect on the Return on Equity (ROE) of the Commercial Banks in Ethiopia

H2: The value of ATM Transactions has a positive and significant effect on the Return on Equity (ROE) of the Commercial Banks in Ethiopia

H3: The value of POS transactions has a positive and significant effect on the Return on Equity (ROE) of the Commercial Banks in Ethiopia

H4: The number of mobile banking users has positive effect on the ROE of commercial banks in Ethiopia

H5: The value of mobile banking transactions has positive effect on the ROE of commercial banks in Ethiopia

H6: The value of internet banking transactions has positive effect on the ROE of commercial banks in Ethiopia

H7: Bank size has a positive effect on the ROE of commercial banks in Ethiopia

1.5 Significance of the study

Nowadays, digitalization is a frequent issue that impacts multiple industries, including the banking sector. There is intense competition among banks, and the effective utilization of digital services is becoming a key factor which determines their survival. This paper has potential to offer valuable insights and contribute to different crucial areas. The findings of this study could provide a key takeaway for financial institutions, particularly banks, to understand the potential benefits and challenges of digital transformation and make well-informed decisions regarding their digitalization strategies by emphasizing the significant effects that digitalization can have on overall financial performance. Additionally, this research will serve as a basis for future studies, offering a strong foundation for those looking to investigate related topics.

Overall, the study's significance lies in its potential to inform various stakeholders about the effects of digitalization on economic performance and its impact on the banking industry by providing insights on which digital services they should invest in to earn high profits eventually.

1.6 Scope of the study

The study focuses on examining the relationship between digitalization and the financial performance of selected commercial banks in Ethiopia. The scope is limited to commercial banks that have adopted various digital technologies such as mobile banking, internet banking, ATM services & core banking systems. The study primarily covers a three-year period (2022-2024), during which significant developments in digital banking of Ethiopian commercial banks have taken place. The financial performance of these banks is measured using a key financial indicator ROE, in relation to the extent of adoption of digital service.

The study investigates both the technological & financial dimensions of digitalization, relying on secondary data such as annual financial reports & digital service performance indicators. The study covers eight Commercial banks selected using purposive sampling technique from thirty Commercial banks in Ethiopia based on being pioneer in adopting digital banking & the availability of data regarding their digital services.

1.7 Organization of the study

The research is presented in five chapters. The first chapter is an introduction, including the background of the study, statement of problem, research hypothesis, the study's objectives, significance & limitations & scope of the study. The second chapter includes literature review, summarizing both theoretical and empirical studies related to digital banking and its effects on financial performance. Chapter three presents the research methodology, outlining the research design, population and sampling techniques, types of data and instruments used, sources of data collection, and methods of data analysis. Chapter four includes data analysis and data interpretations. The last chapter presents conclusion, recommendation, and area for further study.

CHAPTER TWO

LITERATURE REVIEW

This chapter presents a theoretical review about digitalization and a review of existing literature which is related to this research, concerning the impact of digitalization on the financial performance of commercial banks.

2.1. Theoretical Review

2.1.1 Digitalization- Digital Banking

According to Gartner (n.d), digital banking refers to the digitization of banking services where the aim is to minimize the need for customers to physically visit a bank branch. After the last global pandemic, traditional banking systems have become outdated. Customers want efficient, accessible, and essential banking services in a secure environment. Digitalization is the process of moving to a digital business using digital technologies to transform a business model and foster a new method to generate revenue.

Digitalization is a digital transformation process that involves the integration of digital technologies into all areas of a business, leading to fundamental changes in how the business operates and delivers value to its customers. Digitalization of banks refers to the integration of digital technologies and strategies to optimize operations and enhance personalized experiences. It involves shifting from traditional banking practices to modern digital solutions, such as AI, machine learning, and digital channels. Digitalization can boost back-office efficiencies, reduce operational risk, and improve profitability. It also enables online services for customers, allowing transactions and other activities to be conducted digitally (Valenti & Alderman, 2021).

The COVID-19 pandemic significantly accelerated the expansion of digital banking across the globe. During that time a lot of branches were temporarily closed, resulting in physical interactions to be significantly reduced and banking customers were driven to rely on self-service banking solutions. Regardless of their size, every bank experienced a rise in their digital banking

activity. Mobile banking was a key player by providing customers with the ability to check their account status, pay bills, transfer funds, or withdraw cash from ATMs. These factors have also contributed to improved access to a broader range of financial services offered by banks (Valenti & Alderman, 2021).

In recent years, the banking industry has gone through an exceptional transformation, fueled by the rapid technological innovations. This digital transformation in banking and financial services has notably altered how traditional banks operate and engage with their customers. As the world becomes increasingly digital, customer expectations and behaviors have changed which led banks to embrace modern technologies to stay competitive in the industry and provide high quality financial services. The importance of digital transformation in banking is big, as it enables banks to meet customer needs and gives them the ability to compete in the market. Banking transformation refers to adopting digital technologies and strategies to modernize and enhance banking services. It is crucial as it enables banks to enhance efficiency, offer tailored services, increase accessibility, and stay competitive in a rapidly changing industry. This digital innovation in the banking industry has transformed how banks operate, interact with customers and offer financial products and services. The use of ATMs has made it much easier for customers to complete tasks that were once undertaken by bank cashiers, at a lower cost. Additionally, the development of online banking systems has empowered customers to conduct their financial affairs remotely in an unprecedented fashion (HCLTech, 2023).

2.1.2. The Evolution of Digital Banking: A Historical Overview

Digital banking, also known as online banking or internet banking, has become an essential part of modern banking systems. The history of digital banking dates to the early 1980s when telecommunication technologies were initially introduced in the banking industry. The initial focus of digital banking was improving operational efficiency and reducing costs, but it has since evolved to become an integral part of customer experience (Sussie Bank, 2024).

The first online banking system was implemented in the US in 1981 by the City National Bank of Florida. This system allows customers to access their account balances and transactions history through a telephone line. However, it was not until the mid-1990s that internet banking

started to gain popularity, with the widespread adoption of the internet. In 1995, Wells Fargo, introduced the first online banking system which allowed customers to transfer funds, pay bills and access the information about their account through the internet. The first ATM was introduced in London in June 1967 and allowed customers to cash checks and withdraw funds without going to bank branches (Victoria, 2025).

In the early 2000s, digital banking saw a rapid expansion due to the increasing popularity of mobile devices and smartphones. This led to the introduction of mobile banking, which enabled customers to access banking services through their mobile devices. Mobile banking has since become an essential part of digital banking, and it has been improved further with the introduction of mobile payment systems such as Apple Pay and Google Wallet (Bhat, 2019).

Digital banking has not only transformed the way customers interact with their banks, but it has also led to the emergence of fintech and other disruptors in the banking industry. These new players have leveraged digital technologies to offer innovative products and services that challenge traditional banks (Bhat, 2019).

The digital banking has come a long way since its inception in the 1980s. From early days as a cost-saving measure, digital banking has evolved to become an essential part of the customer experience. The adoption of digital banking has been driven by advancements in technology and changes in customer behavior. As digital technologies continue to evolve, the future of digital banking is likely to be shaped by new innovations and disruptions (Bhat, 2019).

Wondwossen (2020) stated developing countries like Ethiopia in Africa highly are striving to adopt financial technologies to modernize the financial system. However, the acceptance of financial technologies from consumers' side faces many challenges. Financial technologies include the electronic-based platforms that are designed by bankers to allow their customers to access financial services whenever they demand it without time and distance barriers.

The advancement of information technology is considered a driving factor that shifts the conventional way of delivering services to digital platforms. Many organizations now days became accessible to their customers regardless of time and distance barriers. Financial institutions are one of the service sectors that is strongly affected by the development of information communications technology and as well as investing huge capital to introduce new

financial technologies. Financial technologies include those financial services that are delivered through electronic-based platforms such as mobile banking, internet banking & card banking. It is believed that electronic-based platforms make accessing financial services easy to bank customers and helps to deliver fast services to bankers compared to the conventional banking services (Bhat, 2019).

Numerous studies have shown that digitalization leads to significant improvements in operational efficiency within commercial banks. For instance, a study by KPMG (2018) found that banks that adopted digital banking solutions reduced transaction costs by up to 30%. This reduction in costs directly contributes to improved financial performance.

The E-banking practice is growing at a significant level and NBE is also trying to support such activity by introducing different payment infrastructure. There is a basic benefit of E-banking for the customers, banks and for the economy which helps to enhance other banks to engage in such activity. It is also indicated that the major barriers Ethiopian banking industry faces in the practice of electronic banking are, absence of skilled manpower, absent well organized ICT infrastructure, costs incurred during the purchases of the software and the device, lack of support from government, absence of legal framework, high rates of illiteracy, frequent power interruption, fear of risk and unavailability of competent and skilled employees (NBE, 2020).

Electronic Banking has been widely used in developed countries and is rapidly expanding in developing countries. In Ethiopia, however, cash is still the most dominant medium of exchange, and electronic payment systems are at an embryonic stage. In the face of rapid expansion of electronic payment systems throughout the developed and the developing world, Ethiopia's financial sector cannot remain an exception in expanding the use of the system (Wondimu, 2013).

Digital transformation activities take up to five years to increase efficiency. Furthermore, there are difficulties with digital transformation that are informative of persistent decreases in efficiency and also profitability. In addition, there are also problems related to IT infrastructure that are a central obstacle to bank performance, which fits well with anecdotal evidence of so-called 'legacy IT' which highlights the importance of careful digital transformation for sustainable bank stability **(**Kriebel, & Debener, 2019).

2.1.3. Digital Banking in Ethiopia

According to Mohammed (2014) the history of modern banking in Ethiopia goes back to 1900s following an agreement signed in 1905 between Emperor Minilik II and Mr.Ma Gillivray who was a representative of the British owned National Bank of Egypt.

Alemayehu (2011) stated that digital financial services were introduced for the first time in Ethiopia in 2001 when the largest state owned, Commercial Bank of Ethiopia's (CBE) implemented ATM machines. Regardless of this the sector has experienced slow growth. Still, some private banks have moved with the adoption of modern technologies in their operations. For example, Dashen Bank became the first private bank in Ethiopia that provided e-commerce and mobile merchant transactions. In the same way, in 2009, Zemen Bank made a crucial impact on the banking sector by introducing fully IT-supported multi-channel banking services which included internet banking, ATM access, SMS banking, and call center banking. These developments marked a key turning point in Ethiopia's digital finance evolution.

In recent years, Ethiopian banks expanded their digital financial services which include mobile, internet, card, and agent banking. The introduction of modern technologies like Eth Switch and Tele birr has helped many banks to expand their customer reach. Additionally, the Ethiopian government has made significant investments in technology, improving infrastructure and implementing electronic information-based services. Key players such as the National Bank of Ethiopia (NBE), Ethio Telecom, and the Ethiopian Ministry of Innovation and Technology are at the forefront of these advancements (Alene, 2023).

Banking in Ethiopia encounters several challenges in fully adopting and adapting E-Banking applications, as well as in leveraging the opportunities presented by ICT applications overall. The primary challenges for E-Banking applications include Limited Internet Access and Underdeveloped Telecommunication Infrastructure: The lack of adequate telecommunications, internet connectivity, and online payment systems hampers the growth and enhancement of e-commerce in Ethiopia. Many rural areas, where a significant number of small and medium enterprises are located, lack internet facilities, preventing them from participating in e-commerce activities, Insufficient Banking System: refers to a financial infrastructure that is inadequate to

meet the needs of the economy and its participants. This can manifest in many ways, impacting individuals, businesses, and overall economic development, High Illiteracy Rates: The low literacy rate poses a significant barrier to the adoption of E-Banking in Ethiopia, as it restricts access to banking services, Expensive Internet Costs: The cost of internet access, when compared to per capita income, is a crucial concern. In Ethiopia, the costs associated with entering the e-commerce market are higher than those in developed countries, Frequent Power Interruptions: regular and unexpected outages of electrical supply, which can occur for several reasons. In Ethiopia, as in many developing countries, these interruptions can significantly impact various sectors, including banking and e-commerce (Gardachew, 2010).

Ethiopia is embarking on a digital transformation journey that it hopes will enable it to achieve its development goals and drive inclusive prosperity. The National Digital Transformation Strategy, also known as 'Digital Ethiopia 2025', serves as the roadmap for Ethiopia's approach. One element is the digital payment eco-system (Besrat, 2024).

2.1.4. Digital Banking Forms

2.1.4.1. Automated Teller Machines

An automated teller machine (ATM) is an electronic banking outlet that allows customers to complete basic transactions without the aid of a branch representative or teller. Anyone with a credit card or debit card can access cash at most ATMs, in other countries. ATMs are convenient, allowing consumers to perform quick self-service transactions such as deposits, cash withdrawals, bill payments, and transfers between accounts. When customers withdraw cash, fees are deducted by the bank where the account is located. If the owner of the ATM machine is a bank other than where the account exists, an additional fee is deducted, and this fee can be avoided by using an ATM machine where the account exists (Kagan, 2023).

ATM is a computerized device that only bank customers use to process account transactions. Users gain access to their accounts by using a special type of plastic card with user information encoded on a magnetic strip. The strip contains an identification code that is sent via modem to the bank's central computer. Users insert the card into ATMs to access their accounts and

process transactions. John Shepherd-Barron invented the automated teller machine in 1960 (Mathur, 2023).

The first ATM appeared at a branch of Barclays Bank in London in 1967, though there are reports of a cash dispenser in use in Japan in the mid-1960s. Within a few years, ATMs had spread around the globe, securing a presence in every major country. They now can be found even in tiny island nations (Kagan, 2023).

Advantages of ATMs include availability 24/7, ensuring privacy in transactions, reduction bank staff workload, often dispensing new currency notes, providing safe, convenient, and error-free service & lowering cash-carrying risks during travel. ATMs use a card reader and keypad for input, and a speaker, display screen, receipt printer, and cash dispenser for output. When a card is inserted and the PIN is entered, the ATM communicates with the bank's host processor via the internet to verify details and authorize cash withdrawal (Mathur, 2023).

Common Services Offered include cash withdrawal (up to a limit), balance inquiry, mini statements, cash deposits, bill payments, loan inquiries, mobile phone voucher purchases, PIN changes, stop payment requests, cheque book requests (Kumar, 2016).

ATM transaction value has a large beneficial influence on commercial bank profitability in Ethiopia, as measured by return on equity. The is an analysis that says the value of ATM transactions positively and significantly influences profitability, probably because they lower operational costs and overheads linked to physical branches, as digital banking services offer more convenient access to essential financial services. This suggested raising the transaction value of ATM transactions has a beneficial influence on commercial bank profits (Abera, 2024).

2.1.4.2. Point-of-Sale Transfer Terminals (POS)

This system enables consumers to pay for retail purchases using a debit card, often referred to as a check card. While it resembles a credit card, the key difference is that the funds for the purchase are immediately deducted from the debit card holder's account and transferred to the retailer's account (Malak, 2007).

There is a significant & positive relationship between the value of POS transactions and performance of banks as measured by ROE, which suggests that an increase in POS terminals is associated with an increase in ROE (Hailu, 2020).

A point of sale (POS) system includes the hardware and software to process payments and complete purchases. A POS, or point of sale, enables merchants to process payments and log transactions. It is a computer-based cash register with software capable of tallying orders, taking payments, monitoring inventory, and buying trends, creating invoices, and collecting marketing data (Adam, 2024).

POS technology includes countertop terminals and apps that let people or businesses take payments with connected devices such as smartphones. A POS may be a physical device in a brick-and-mortar store, or a checkout point in a web-based store. It commonly uses barcode scanning to calculate the total cost of an order, take payment, and log the transaction. The software records data, including the name and quantity of the items (Adam, 2024).

Cash payments involve inserting notes or coins into a machine. Card payments require swiping, inserting, or tapping the card onto the reader. The POS system connects to the cardholder's bank, potentially asks for a PIN code, checks funds to clear the transaction, and confirms whether the payment has been completed or rejected. E-commerce businesses also use POS platforms to facilitate and track online sales. Consumers click the checkout option and input payment details. It has two innovations: EMV chips and Near Field Communication (NFC) technology, which help prevent fraudulent transactions for POS terminals. Systems read encrypted data in the card and detect and decline counterfeit cards. These systems wirelessly accept and authorize payment from a contactless card or payment data stored on a smartphone, and this technology ensures the card data isn't stored in the merchant's system (Adam, 2024).

2.1.4.3. Internet Banking

Internet banking, also known as online banking or e-banking, is a convenient and secure way to access your bank account, pay bills, transfer money, and manage your finances using the internet. With internet banking, customers do not have to visit a bank branch in person or wait in long queues to perform banking transactions. Instead, they can access their account from

anywhere and at any time using their computer, smartphone, or tablet. Internet banking has become increasingly popular over the years, as more people prefer to manage their finances online (Emile, 2023).

A banking facility provided to the customers through which the customers can perform a number of monetary and non-monetary transactions, using the internet, through the bank's website or application. Internet banking allows a user to conduct financial transactions via the internet and offers every service traditionally available through a local branch including balance inquiry, transfers, Mini Statement, detailed transactions, and online bill payments. It provides easy, convenient, flexible, and secure payment services for banks' customers (Emile, 2023).

2.1.4.4. Mobile Banking

Mobile banking (m-banking) refers to the use of a mobile device to access banking and financial services offered by banks. It enables customers to check their bank account balance, conduct online transactions, transfer funds, pay bills, etc., without visiting banks. Mobile banking (m-banking) refers to the use of a mobile device like a smartphone or tablet to perform banking activities. It is done through a mobile app, USSD, or SMS. It enables customers to access banking services easily, quickly, and conveniently anytime, anywhere. Customers utilize mobile banking to view and monitor account details, transfer funds, apply or repay a loan, make investments, lodge complaints, deposit checks, etc. The key difference between mobile and internet banking is that the former uses a mobile device while the latter employs a desktop or PC. M-banking is susceptible to online frauds but safety features like two-step OTP verification, biometric login, and antivirus help to secure transactions (Ahmed, 2022).

Busy lifestyle and, more recently, the COVID pandemic have forced people to opt for mobile banking. Round-the-clock banking services at the fingertips provide customers with an easy, quick, and hassle-free experience. At the same time, banks also benefit from a reduction in operating costs due to savings in time and resources. Additionally, the rise of AI agents in finance has further enhanced the banking experience, enabling more personalized and automated services.

2.1.4.5. Debit Card

A debit card is a plastic payment card that provides the cardholder with electronic access to their bank account. Debit cards allow cardholders to make purchases and withdraw cash from ATMs by directly debiting the associated account, rather than borrowing money from a credit card issuer. Debit cards have become an essential component of modern banking, offering convenience, speed, and security in financial transactions. They have revolutionized the way people manage their money and conduct everyday transactions, reducing the reliance on cash and checks. Personal Identification Number (PIN) based transactions require the cardholder to enter a unique numeric code to authenticate the transaction. This provides an additional layer of security, as the transaction cannot be done without the correct PIN (Tamplin, 2023).

Debit cards, also known as bank or check cards, typically can be used anywhere credit cards are accepted and to withdraw money from an ATM. In many ways, using a debit card is like carrying cash since you have limited funds to draw from. Debit cards can be used in our day-to-day life to perform number of transactions. Debit cards are linked to the customer's bank account and so the customer only needs to swipe the card, to make payment at Point of Sale (POS) outlets, online shopping, ATM withdrawal. In this way, the amount is deducted from the customer's account (Gibsson, 2025).

A research conducted by Alemayehu (2020), indicated that the number of debit card users had a positive & significant effect on the ROE of Ethiopian commercial banks where the possible reason could be the increase in the number of debit card users drive higher usage at ATMs & POS terminals which boosts fee-based income & transaction related revenue without a proportional increase in costs.

2.1.4.6. Credit Card

A credit card is a small revolving line of credit from an issuing bank. While it can be easy to look at credit cards as "free money," this loan is subject to various interest rates, most notably in the form of an APR (or annual percentage rate) that's charged to the balance of a customer when it is not paid off in full at the end of a billing cycle. It's called "revolving credit" because it

enables users to borrow as often as they'd like, up to a predetermined credit card limit, and repay the borrowed amount in installments. The credit limit is the maximum amount of money the card issuer will allow a user to spend with the card. Issuers usually establish the limit based on the credit score, income, debts and other criteria they look at as part of the credit card application approval process (Ahmed, 2022).

2.1.4.7. Agency Banking

Agent Banking means providing limited scale banking and financial services to the underserved population through engaged agents under a valid agency agreement, rather than a teller/cashier. It is the owner of an outlet who conducts banking transactions on behalf of a bank. Agent Banking has been adopted and implemented with varying degrees of success by several developing countries. Brazil is often recognized as a global pioneer in this area since it was an early adopter of the model and over the years has developed a mature network of Agent banks covering more than 99% of the country's municipalities. Other countries have followed suit, including Mexico, Peru, Colombia, Ecuador, Venezuela, Argentina, Bolivia, Pakistan, Philippines, Kenya, South Africa, Uganda and India (BRAC Bank, 2025).

2.1.4.7. Mobile Wallet (MW)

A mobile wallet is either a built-in feature or an app that can be installed onto smartphones. A mobile wallet stores credit card, debit card, coupon, or reward card information and can connect directly to bank accounts (Will, 2024).

A mobile wallet stores credit or debit card information on a mobile device, such as a smartphone, tablet, or smartwatch. Mobile wallets are a convenient way for you to buy things online or in stores that are set up to take payments through the wallet. They may also be more secure than physical payment cards because of the technology they use to protect your account information (Will, 2024).

Three of the main mobile built-in wallets are Apple Wallet, Google Wallet, and Samsung Wallet. These apps store the payment card information but can also hold other documents such as event tickets, vaccination records, or airline boarding passes. They are integrated with their respective

payment services (Apple Pay, Google Pay, and Samsung Wallet), which are used to make payments. A user may not even notice the difference between, say, Apple Wallet and Apple Pay. (Will, 2024).

Most smartphones and mobile devices are equipped with NFC technology. IPhones have Apple Wallet and Apple Pay, Android phones are often equipped with Google Wallet, and Samsung Galaxy phones are preloaded with their proprietary Samsung Wallet, which includes Samsung Pay. Besides what comes preloaded on smartphones, mobile wallets from other companies have also become immensely popular (Will, 2024).

2.1.5. Determinants of Financial Performance

2.1.5.1 The return on equity (ROE)

ROE = Net Income/Average Shareholders' Equity

Return on Equity (ROE) is the measure of a company's annual return (net income) divided by the value of its total shareholders' equity, expressed as a percentage. Alternatively, ROE can also be derived by dividing the firm's dividend growth rate by its earnings retention rate (1 – dividend payout ratio). Return on Equity is a two-part ratio in its derivation because it brings together the income statement and the balance sheet, where net income or profit is compared to the shareholders' equity. The number represents the total return on equity capital and shows the firm's ability to turn equity investments into profits. To put it another way, it measures the profits made for each dollar from shareholders' equity (Gunnars, 2023).

ROE provides a simple metric for evaluating investment returns. By comparing a company's ROE to the industry's average, something may be pinpointed about the company's competitive advantage. ROE may also provide insight into how the company management is using financing from equity to grow the business. A sustainable and increasing ROE over time can mean a company is good at generating shareholder value because it knows how to reinvest its earnings wisely, so as to increase productivity and profits. In contrast, a declining ROE can mean that management is making poor decisions on reinvesting capital in unproductive assets (Gunnars, 2023).

2.1.5.1 The return on Assets (ROA)

ROA = Net Income/Average Total Assets

Return on assets (ROA) ratio is a metric used to evaluate how efficiently a company is able to generate profit with the assets it has available. It measures the percentage of how much income a company's net operating profit, after taxes, has earned annually on average over three years from all the business operations and investments. ROA is very useful in differentiating between competing companies and can be used to compare similar companies within the same industry. It provides information about the relationship between income and assets employed. It takes into consideration all types of assets, like working capital, property, equipment, and investments in securities. It is a very good measure of management performance. ROA focuses attention on the assets being used to generate earnings for shareholders investors (Tamplin, 2023).

2.1.5.1 The return on Investment (ROI)

Return on investment is a simple ratio that divides the net profit (or loss) from an investment by its cost. Because it is expressed as a percentage, you can compare the effectiveness or profitability of different investment choices. To calculate return on investment, divide the amount you earned from an investment often called the net profit, or the cost of the investment minus its present value by the cost of the investment and multiply that by 100. The result should be represented as a percentage. Here are two ways to represent this formula:

ROI = (Net Profit / Cost of Investment) x 100

ROI = (Present Value – Cost of Investment / Cost of Investment) x 100

According to conventional wisdom, an annual ROI of approximately 7% or greater is considered a good ROI for an investment in stocks. ROI is an understandable and easily calculated metric for determining the efficiency of an investment. This widely used calculation allows you to compare apple-to-apples among investment options. But ROI cannot be the only metric investors

use to make their decisions as it does not account for risk or time horizon, and it requires an exact measure of all costs (Birken, E. G. ,2022).

2.1.6. Digitalization & Financial Performance

E-banking has a positive effect on bank turnover, profitability and on employment, significantly when banks align e-commerce as part of their larger business strategies. The use of e-banking can improve bank performance by increasing market share, expanding product range, customizing products and giving a better response to clients' demand. The influence of e-banking on the activities and income structure of banks is getting higher (Kariuki, 2005).

2.1.7. Future of Digital Banking

Digitization has rapidly transformed & penetrated the world with technological advancements in every industry. This has made traditional banking systems lose their effectiveness, as Big Tech and Fintech companies are entering the banking industry at an unprecedented pace. The adoption of digitalization has become inevitable for banks in hopes to compete in the industry and therefore are embracing digital banking (Kayrouz, 2021).

Banks need to decide where they want to be by using digital banking this will be a steppingstone to where their real future lies. Banking as A Platform (BAAP) is a new concept which has immense potential. Platform banking provides a digital marketplace for banking and even for non-banking services by increasing the limits of what it can provide. This concept is not easily achievable, and banks have many factors to consider before embarking on this initiative (Kayrouz, 2021).

By 2030, banking customers expect banks to know them & be smoothly aligned with their lifestyle. They will expect the interaction with their banks to be automated & user-friendly processes which minimize their time & effort. They will anticipate banks to be pioneers of trust & cyber security, and that they will take an active role in managing customers' finances & offer both products & perception. Over the next decade we will see more changes in the banking industry than we have witnessed in the past 100 years. This is not only due to the existence of

advancing technologies, but also due to a junction of inter-related, structural factors, demographic, socio-economic, regulatory & environmental changes (KPMG, 2021).

2.2. Empirical Review

2.2.1. Related Empirical Studies in the World

Dinçer & Yükse (2018) studied the effects of electronic banking technologies on bank profitability and costs in developed and emerging economies. The researchers used annual data for the period between 2005 and 2015 for 23 countries for the study & panel data method was taken into consideration in the analysis process. ATM, POS and card data were the independent variables whereas return on equity and cost/income ratio variables were considered as indicators of the financial performance of the banks. The findings showed that some technologies, such as ATMs used by banks, have a positive effect on earnings and negative impacts on the costs. The study also determined that bank cards and POS terminals have a positive effect on earnings but not profitability. Despite the increase in card and POS terminals, the negative effects of these variables on profitability may depend on the height of the technological investments made, the dissemination of the service network and the high operating costs. The study suggested that it is necessary to determine the optimum level of expenditure so that the use of technology can have effects that will increase the bank profits and productivity. However, it can also be said that under high competition conditions, banks should give importance to technological investments.

Giaretta & Chesini (2018) assessed the effects of the digitalization of the financial sector on bank performance in Europe in the years 2000-2015. The researchers used data collected from Eurostat of the European Commission of the European Union and from World Development Indicators (WDI) of the World Bank. The sample included country-level data on 17 European countries, namely Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France,

Germany, Greece, Hungary, Italy, Lithuania, Luxembourg, Netherlands, Slovakia, Slovenia, and United Kingdom. The data collected were in units of USD. The results of the study demonstrated that investments in digitalization have a positive effect on bank profitability & also the presence of Automatic Teller Machines (ATMs) contributes to an enhancement of income for banks and financial companies; conversely, the presence of physical branches has no effects.

Vanitha & Bhuvaneswari (2020) investigated the impact of digital Banking Transactions & financial performance in selected banks in India. The study used ATM Transaction volumes & Volumes of POS transactions to assess the impact on financial performance by using 3 years of secondary data from the year 2017 to 2019 collected from the annual report of target banks. The researcher used both descriptive statistics & inferential statistics to analyze the data. The study concluded that the relation between mobile transactions & profitability is positive & there's a significant relationship between digital transactions & financial performance as E-banking services reduced corruption & increased the flow of money circulation.

Mbama et al., (2018) examined managers' perceptions of digital banking's effect on customer experience and banks' financial performance. The research used interviews from senior UK Bank managers to gather their views on digital banking impact on customer experience and financial performance. The interviews were analyzed to produce results and a model. The study indicated digital banking is conducted globally, which implies that the findings are robust enough to be potentially applied in other countries, as a limitation. The research demonstrated that banks could improve financial performance using digital banking, highlighting the relevance of employee-customer engagement, and improving customer experience in DB marketing.

2.2.1. Related Empirical Studies in Africa

Mwau (2019) conducted a study to assess the influence of digital innovations pertaining to profitability of commercial banks in Kenya by evaluating the use of credit cards through number of transactions, POS transactions, number of agents & also the number of mobile payment transactions & found a positive impact on credit card transactions & mobile payment transactions while the number of agents & POS transactions were found to affect financial performance negatively & recommended for banks to be more cautious when using the latter two

in order not to affect their financial performance negatively. The researcher collected primary data by close ended questionnaires from all commercial banks in Kenya & secondary data from reports & used multiple regression model for analysis.

Charles (2021) examined how e-banking affected Kenyan banks' economic performance by collecting secondary data from annual reports of 41 banks in Kenya & used descriptive research design. The researcher used ROA as a proxy of financial performance. The results of the study showed that ATM & internet banking have a positive influence on banks' performance by reducing transaction costs while mobile banking has a negative impact.

Ahiadorme, (2018) evaluated the influence of digital delivery channels on the financial performance of Ghana banks. The researcher used secondary data in the form of cross-sectional data. The data was collected from the banks' annual financial reports and Price Waterhouse Coopers' Ghana banking annual survey reports. The study employed a multiple linear regression model to examine the influences of digital delivery channels on the profit performance and cost efficiency of banks. The findings of this study indicated that automated teller machines (ATM) and internet banking applications improve the performance and the cost efficiency of banks, however mobile banking applications have decreasing effects on banks' cost efficiency and performance. The results suggested that while digital innovations may exert significant positive influence on bank performance, there may be cost implications for the banks. It is crucial that banks while adopting digital innovations, should also engage in a reduction of the proportion of overdue and underperforming assets.

Felix (2016) studied the influence of mobile banking on economic performance of banks in Kenya. The study employed purposive sampling method to select 8 commercial banks & collected secondary data from the selected commercial banks. The collected data was analyzed by using regression analysis. The results of the study revealed that mobile banking transactions had a positive effect on bank performance in Kenya and this effect was significant and suggested for commercial banks to increase their investments on mobile banking to remain profitable.

Ahumuza & Adkin (2024) conducted research to evaluate implications of electronic banking on commercial banks' financial performance in Uganda, using Stanbic Bank as a case study. The researchers used a mixed-methods sequential explanatory research design by gathering both

quantitative and qualitative primary data from in depth interviews with senior management in the bank & financial statement information documenting profitability, efficiency, efficiency, asset quality and liquidity ratios for the period 2010 to 2020 were quantitatively evaluated. The results indicated electronic banking adoption at Stanbic Bank was associated with statistically significant improvements in return on assets & it positively contributes to enhanced financial outcomes for commercial banks in Uganda by reducing costs and increasing revenues.

2.2.2. Empirical Studies in Ethiopia

Worku (2016) conducted a study to measure the roles of E-Banking Services on Banks' fiscal performance in Ethiopia, using purposive sampling to select ten banks from 2013 to 2015. The study employed a balanced panel regression model based on OLS and random effects estimates from secondary data, primarily annual audited reports. It analyzed the impact of e-banking services, such as transaction values for ATMs and POS, number of terminals, and bank market share, on financial performance. The researcher concluded that the increased number of ATM & POS had a positive role on the financial performance of commercial banks with many banking institutions & recommended an increase of services via e-banking points and increase of quality of presenting e-banking services, by updating equipment and software and increase of ATM numbers, POS and optimal location so that banks can achieve the mentioned goals.

Abebe (2016) studied influence of information and communication technology on performance of Banks in Ethiopia by using secondary data collected from six commercial banks selected by employing purposive sampling technique over the period 2010 – 2014 & the data was analyzed using the OLS technique. The study used ROA to measure the sample commercial banks' performance, and the explanatory variables were ICT investment, ATM, POS, INF, BRAN and GDP. The regression result showed that the ICT, ATM and POS have no statistically significant effect on return on asset on commercial banks in Ethiopia & suggested that banks should put more effort in advertising these products.

Mekonnen (2022) studied the influence of digitalization on banks' profitability in Ethiopia from 2018 to 2021 on nine commercial banks selected by using purposive sampling method. The researcher used primary data from questionnaires & analyzed the data by using descriptive

statistics and multiple regression models and the analysis was done using Statistical Package for Social Sciences. The research studied the dependent variable, profitability, by using ROE as proxy. The research stated that digitalization has a positive impact on profitability as it minimizes customer physical engagement with bank branches and reduces transactional costs through efficient and effective integration of front and back offices of the banks & concluded that ATM transaction value has a large beneficial influence on commercial bank profitability in Ethiopia, as measured by return on equity suggesting to raise the transaction value of ATM transactions as it has a beneficial influence on commercial bank profits while the other independent variable proxies had insignificant effect on financial performance of commercial banks.

Mezgebu (2017) studied the influence of IT investment on performance of banks in Ethiopia by using a mixed approach with an explanatory research design. The researcher used data collected from eight Commercial Banks selected in by using a purposive sampling method for the period 2006 – 2015. The study employed a multivariate regression model using Return on Asset (ROA), as a dependent variable for measuring the financial performance of the selected banks and six independent variables which are hardware, software, and IT services & used employee efficiency, market concentration, and inflation as a control variable. The study indicated that investment on IT services has a significant and positive impact while investment in hardware and software has negative and significant impact. The study also found that employee efficiency had a negative and insignificant effect on performance, whereas market concentration has a positive insignificant effect and inflation positive and significant effect.

Ayal (2018) examined the factors affecting adoption of e-banking system in Ethiopian banking industry. The study was conducted based on the data gathered from five banks in Ethiopia; four private banks & one state owned bank & the data collected was analyzed using descriptive statistics by using spss version 20. The study indicated that technological factors (perceived risk), human and financial resources, national ICT infrastructure, lack of legal and regulatory framework, lack of government support and lack of completion from foreign banks, gender, age and education level, and lack of awareness and lack of trust on the system are major driving factors in adopting e- banking among commercial banks in Ethiopia. The study recommended banks should launch campaigns to create direct awareness to issues such as fear of the lack of

privacy and security, along with the relative advantages of using E-banking products and consistently review and upgrade the existing system of security to the level that minimize risk, while the government should support banking sector by facilitating sufficient ICT infrastructure development.

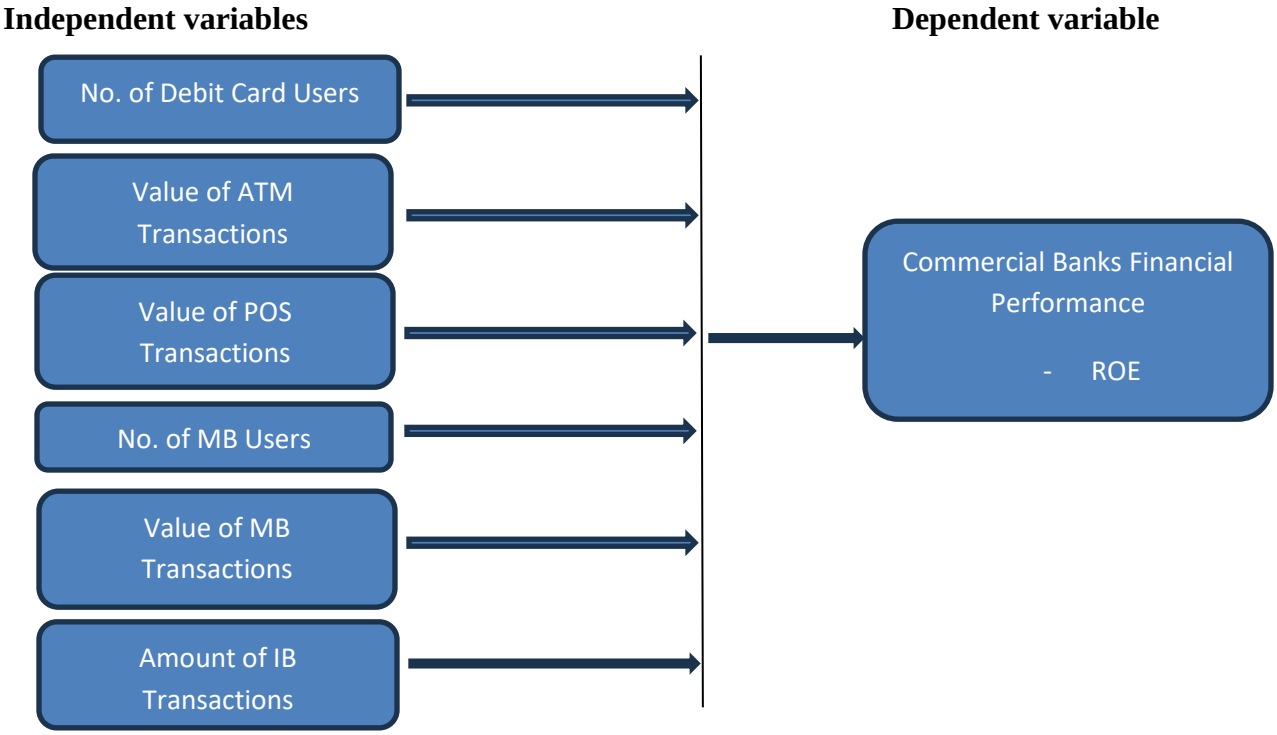
Gardachew (2010), investigated the practices, opportunities, and challenges of E banking in Ethiopia by studying the core challenges and opportunities of E-banking. The researcher carried out a survey and indicated that the challenges are low level of internet penetration, poorly developed telecommunication infrastructure, lack of suitable legal and regulatory framework for e-commerce and e-payment, high rates of illiteracy, high cost of internet, absence of financial networks that link different banks, lack of reliable power supply and cyber security issues. The study indicated opportunities are offered by ICT through e-learning programs, with the help of nongovernmental agencies like ECA and World Bank to developing countries to design national strategies like e-commerce and commitment of the government on ICT as prospects for E banking development.

2.3. Research Gap

Despite the growing trend of digitalization in the Ethiopian banking sector, there is limited empirical evidence on its influence on banks' financial performance whereas there have been many studies conducted in the African banking industry. Most of the previous researches in Ethiopia were conducted to study the adoption, opportunities & challenges of digitalization and only few researches were conducted to analyze the relationship between digitalization & financial performance. The researches conducted did not include all E-banking channels such as internet banking and had also mixed results. Understanding the relationship between digitalization and financial performance is crucial for stakeholders, including bank management, policymakers, and investors. As Ethiopia continues to develop its digital economy, suggestions from this research could give key takeaways for stakeholders to make decisions which enhances the competitiveness of commercial banks and contribute to the overall stability of the financial system.

Therefore, this research aims to investigate the influence of digitalization by using a key financial indicator, Return on Equity (ROE) to examine the effect of digital service factors such as number of debit card users, value of ATM transactions, value of POS transactions, number of mobile banking users, value of mobile banking transactions, value of internet banking transactions & bank size. By examining the effects of these explanatory variables on commercial banks' financial performance, this study has tried to provide profound perceptions into the implications of digital transformation in the banking sector and contribute to the development of effective digitalization strategies for commercial banks and similar financial institutions.

Figure 2. 1. Conceptual framework



Source: Compiled by the Researcher

CHAPTER THREE

RESEARCH METHODOLOGY & DESIGN

Research methodology means understanding the entire research process-including its social-organizational context, philosophical assumptions, ethical principles, and the political impact of new knowledge from the research enterprise. Methods refer to the collection of specific techniques we use in a study to select cases, measure observing social life, gather and refine data, analyze data, and report on results (Adedoyin, 2020). The chapter is organized into four parts which includes: research design, model specification, variables definition & operationalization of variables.

3.1. Research Design

To conduct research successfully, a suitable research design is required. Research design is a strategy which is embraced by a researcher before collecting data so as to accomplish the research objective while ensuring validity. The core of research design is translating a research problem into data for analysis to give relevant answers to research questions by utilizing a minimum cost (Asenahabi, 2019).

This paper sought to explore how digitalization influences financial outcomes of banks**.** To achieve this purpose, explanatory research design was employed with a quantitative approach. The researcher used a panel data study approach & STATA 15 was used to assess the collected data. Furthermore, descriptive analysis, correlation, autocorrelation & normality tests were conducted.

3.1.1. Population and Sampling Techniques

3.1.1.1 Target Population

The target population of the study was all Commercial Banks in Ethiopia that have adopted e-banking services & operating during the years 2022 to 2024. The annual audited financial

statement of commercial banks & their digital service reports for the selected period was used as a main source of data to gather valuable information for the study.

3.1.1.2. Sampling Methods

The researcher used purposive, also known as judgmental sampling which is a non-random sampling method to select commercial banks based on available information & their digital application that can be gathered for the research. By using purposive sampling technique from 30 commercial banks operating in Ethiopia the researcher took eight banks based on information available on their annual reports, based on being pioneer in implementing e-banking services & based on availability of data. Based on these stated criterions, the selected banks are Commercial bank of Ethiopia, Awash Bank, Dashen bank, Bank of Abyssinia (BoA), United Bank, Wegagen bank, Oromia International Bank & Global Bank.

3.1.2 Source and types of Data

The study employed a quantitative research approach by using secondary data gathered from published annual reports & head offices of eight purposively selected banks out of 30 existing commercial banks. The researcher used panel data covering a period of 3 years.

Panel data, which is also referred to as longitudinal data, is data which contains observations about different cross sections across time. Panel data contains observations collected at a regular frequency, chronologically which makes it like time series data & it also contains observations across a collection of individuals making it resemble cross-sectional data (Eric, 2025). Three years of data from the year 2022-2024 was used to study the effect of explanatory variables on financial performance. Published documents were used to construct the literature part of this thesis and cited accordingly.

3.1.3 Methods of Data Collection

The study primarily relied on secondary data collection methods, using published audited annual financial reports & digital service records from selected commercial banks in Ethiopia. Annual reports, audited financial statements, and relevant publications from the banks' official websites

were the main sources of data. These documents provided key financial performance indicators such as Return on Equity.

3.1.4 Methods of Data Analysis

Once collected, the data was analyzed using multiple linear regression analysis. Regression is a statistical method used in finance & investing to determine the quality & dynamics of the relationship between a dependent variable and one or more independent variables. (Beers, 2025)

The research was conducted using Stata 15 econometric software package, ensuring accuracy & reliability in interpreting data. The data from STATA was analyzed by using analyses such as descriptive statistics to summarize key variables such as ROE & and digital service variables to know the general overview of trends and patterns over the selected study period and inferential statistical techniques specifically regression analysis was used to examine the relationship between digitalization & financial performance.

3.2. Model Specification

Model specification is an essential process of determining which independent variables to include and exclude from a regression equation & model specification is the process of building a statistical model & consists of choosing a suitable functional form for the model and specifying which variables to include (Frost, 2019).

This chapter outlines an analytical structure of analysis according to the studies in the literature review section by designing a model to illustrate the importance of specific key variables which impact ROE. The performance indicator used for the study was Return on equity (ROE) and the independent variables studied were: number of debit card users, number of mobile banking users, value of ATM transactions, value of POS transactions, value mobile banking transactions, value internet banking transactions where the control variable used was bank size.

The general multi regression model with K independent variables can be written as follows:

$$Yi = \beta 0 + \beta 1X1i + \beta 2X2i + \ldots + \beta kXki + \varepsilon i \ (i\ 1, 2, 3\ldots, n)$$

Where Yi is the ith observation of the dependent variable, X1i,…, Xki are the ith observation of the independent variables, β0,…,βk are the regression coefficients, εi is the ith observation of the stochastic error term, and n is the number of observations.

The researcher used multiple regression model to understand the relationship between the dependent & the independent variables. The regression model which the researcher used in the study is specified as follows:

ROE= β0+β1(NDCU) +β2(VATMT) +β3(VPOST) +β4(NMBU) +β5(VMBT) +β6(VIBT) +β7(BS) +ϵ

Where:

ROE = Net Income/ Shareholder's equity

NDCU= Number of Debit Card users

VATMT = Value of ATM transactions

VPOST = Value of POS transactions

NMBU= Number of mobile banking users

VMBT= Value of mobile banking transactions

VIBT= Value of internet banking transactions

BS= Bank Size

ϵ represents the error term.

β0 is the intercept

β1, β2, β3, β4, β4, β5, β6, are coefficients for each independent variable

β7 is a coefficient for the control variable, bank size.

3.3. Variables Definition

The variables that will be studied need to be specified in quantitative research.

3.3.1. Dependent Variable

The dependent variable the researcher chose for the study was ROE (Return on Equity) & it is used to assess the performance of banks and is considered an indicator of an entity's overall financial well-being. It measures the profitability relative to shareholders' equity & is calculated by dividing net income after taxes by average stockholders' equity.

3.3.2. Independent Variables

The independent variables considered by the researcher were the number of Debit card users, value of ATM transactions, value of POS transactions & number of mobile banking users, value of mobile banking transactions & value of Internet banking transactions of commercial banks.

3.3.2.1 Number of Debit Card Users (NDCU)

Debit card users will not go into debt because they only use the money that is currently found in their account. Debit cards have become an integral part of everyday financial transactions for consumers across the globe. It is linked to a user's bank account & debit cards provide a secure and convenient way to purchase goods and services without the need to carry cash. There has been a significant evolution in how these cards are used, the technology behind them, and the statistical landscape surrounding their usage (The business research company, 2025).

The debit card market size is expected to see marginal growth in the next few years. It will grow to $103.66 billion in 2029 at a compound annual growth rate (CAGR) of 1.7%. The growth in the forecast period can be attributed to rising contactless payment adoption, financial inclusion initiatives, rising government cashless initiatives, personal finance management features, e-commerce, and online spending. Major trends in the forecast period include incorporation of digital currencies, personal budgeting tools, sustainable card materials, enhanced fraud

prevention measures, open banking integration, partnerships with fintech. The substantial growth was unveiled in a snapshot of Ethiopia's Financial Sector Indicators as of March 2023. As per the snapshot, Ethiopia has 35 million debit card holders (The business research company, 2025).

Research conducted by Munyavi et al., (2017) with a title of Effect of debit card usage on the financial performance of commercial banks in Kenya found that increased debit card usage can lead to higher non-interest income and improved operational efficiency, positively impacting ROE. Tilahun (2016) also suggested that the number of debit card users has a positive significant association with profitability indicators like ROA & ROE in the research conducted to examine the effects of electronic banking on the financial performance of commercial banks in Ethiopia.

3.3.2.2. Value of ATM Transactions

At present, there are more than 3.2 million ATMs around the world. While this number might appear a little meek at first, it is still a testimony to how the popularity of ATM usage is rising (Elad, 2023).

The average number of ATM transactions per year per machine is roughly 50,000 & approximately 60% of consumers prefer using ATMs over bank tellers for cash withdrawals. Global ATM usage exceeds 60 billion transactions, driven by contactless growth (Linder, 2025).

As per ATM statistics and trends, ATM transactions across the globe grew up to $12.6 trillion in 2021**.** In Africa, ATM usage rose by 25% in 2023 due to increased banking infrastructure. ATM usage is not only a testament to cash's continuing relevance but also a rapidly evolving landscape driven by contactless innovations, increased global deployment, and shifting consumer preferences (Linder, 2025).

Ngaruiya, B. W., Bosire, M., & Kamau, J. (2014) conducted a study to examine the effect of Automated Teller Machines on the financial performance of commercial banks in Kenya. & indicated that higher ATM transaction volumes increase service accessibility and efficiency, leading to better financial performance. Mekonnen (2022) in her study of the impact of

digitalization on bank profitability: The case of selected commercial banks in Ethiopia demonstrated that ATM transaction value had a significant positive effect on ROE.

3.3.2.3. Value of POS Transactions

A study found that the total value of transactions processed by POS terminals will exceed $17.3 trillion in 2026, from $14.8 trillion in 2021, growing 28%. The growth is driven by a continually evolving payment processing landscape in which cash plays a reduced role. The global retail POS market was valued at $88 billion in 2024 & it was recommended that POS vendors must ensure they support omnichannel retail business models and are prepared to compete with alternative payment methods such as QR code payments (Elad, 2025).

Ozili, (2018) conducted a study to examine the impact of digital finance on financial inclusion and stability & indicated that POS technology enhances transaction convenience and service delivery, which can indirectly improve financial performance metrics like ROE. Tegenu et al., (2020) studied the effects of electronic banking on bank performance of selected commercial banks in Ethiopia and found a positive and significant link between POS transaction value and ROE.

3.3.2.4. Number of mobile banking Users

Mobile money services are a convenient way to manage personal finances without a traditional bank account. Internationally, East Asia, including China, has the highest number of mobile money service users. More than 805 million people in that region, aged 15 and older, use mobile services. Several African countries also have a high percentage of residents who use mobile money services. & these service users are also a high percentage of those who use any type of financial institution. For example, 68.7 percent of residents in Kenya use mobile money services. Only 79 percent of residents use any financial services, meaning most people who bank in Kenya do so through mobile services. In Uganda, 53.8 percent use mobile services out of the 66 percent who use any financial services. In Zambia, 41.6 percent use mobile services, while only 48.52 percent use any financial services (World population review, 2025).

Mobile money accounts in Ethiopia have seen a significant increase, reaching close to 60 million subscribers, according to data released by the National Bank of Ethiopia. This figure represents more than a two-fold increase between December 2021 and 2022, indicating a sweeping trend in the country's banking habits (Team Shega, 2023). The substantial growth was unveiled in a snapshot of Ethiopia's Financial Sector Indicators as of March 2023. As per the snapshot, Ethiopia has 22 million mobile banking users (Team Shega, 2023).

Mobile banking has become the most widely used digital payment channel in Ethiopia. The National Bank of Ethiopia's Financial Stability Report highlights this trend. By June 2024, the number of registered mobile banking accounts increased by 45%, reaching 39.6 million. The growth in mobile banking signals a significant shift toward digital financial services in the country. Several factors drive this rapid adoption of mobile banking. First, widespread mobile connectivity allows millions of people to use their phones for financial transactions. The Ethiopian government actively promotes digital transformation, aiming to modernize the economy and expand access to financial services. This initiative helps boost financial inclusion (Nadeem , 2024).

The impact of mobile banking goes beyond convenience; it significantly contributes to economic growth. In 2023, Ethiopia processed a substantial volume of digital payments, reflecting the growing reliance on electronic transactions among businesses and consumers. Mobile banking enhances transaction transparency and efficiency by reducing cash dependency, creating a healthier economic environment (Nadeem , 2024).

Despite these advancements, numerous challenges remain & many regions still lack reliable internet access, which can hinder digital transactions. Additionally, educating users about digital financial services is essential. Some potential users may not fully understand or trust these modern technologies, which can slow adoption rates. Establishing strong legal and regulatory frameworks is also crucial to protect users and maintain the integrity of digital financial services (Nadeem , 2024).

The rapid growth of mobile banking in Ethiopia represents a transformative shift in how people access financial services. With continued investment in infrastructure, education, and regulatory support, Ethiopia can further enhance financial inclusion and stimulate economic growth. As we

look ahead, mobile banking will play an increasingly vital role in shaping the country's financial future (Nadeem , 2024).

Mbama, & Ezepue (2018) studied digital banking, customer experience and bank financial performance in the UK and showed mobile banking usage leads to improved efficiency and cost reduction, positively impacting financial performance. Elias (2019) conducted a study to evaluate the role of electronic banking on the financial performance of commercial banks in and found a positive and significant relationship between the number of mobile banking users and ROE.

3.3.2.5. Value of mobile banking transactions

The Global System for Mobile Communications Association (GSMA) has revealed that over $1.68 trillion flowed through mobile money accounts globally in 2024, demonstrating the growing role of digital finance in facilitating financial inclusion and economic activity across the world (Adigun, 2025).

According to the State of the Industry Report on Mobile Money released in 2025, mobile money services processed approximately 108 billion transactions in 2024 alone, representing a 20% increase in transaction volume compared to 2023. This marks yet another year of sustained double-digit growth for the mobile money industry. The report also indicated that transaction values grew by 15% to reach $227 billion in 2024, up from a 13% growth rate recorded the previous year (Adigun, 2025). Despite the slowest year-on-year growth in active accounts, East Africa recorded the fastest rise in mobile transaction value (GSMA, 2025).

Aduda & Kingoo (2012) conducted a study to examine the relationship between mobile banking and financial performance among commercial banks in Kenya and found mobile banking transaction values correlate positively with bank profitability.

3.3.2.6. Value of Internet banking transactions

Dhaka (2025) indicated that internet banking, which is also known as online banking, allows users to conduct financial transactions over the internet and provides them with every service which was available only through a local branch, such as deposits, transfers, and online bill

payments. Bankers have stated that internet banking is a safe and convenient way to carry out banking activities while maintaining physical distancing. The expanding number of internet users and the availability of smartphones aided the widespread adoption of internet banking.

Malhotra & Singh (2009) conducted a study to assess the impact of Internet banking on bank performance and risk and supported the view that internet banking enhances operational performance and financial returns.

3.3.3. Control Variable

The researcher used bank size as a control variable to account for potential confounding effects. Including this variable helps to account for size related economies & diseconomies of scale. Bank size is measured by using year-end natural log of total assets which can be found from the balance sheets of the commercial banks.

Larger banks enjoy a higher profit than smaller banks in Ethiopia banking sector because they are exploiting the benefit of economies of scale. Also, larger banks generally have sufficient capital and usually have detailed asset management plans than smaller banks. Therefore, it can be concluded that large banks have high profit and higher operating cost efficiency than small banks (Muze, 2019).

A study conducted by Athanasoglou, et.al, (2008) with the title of Bank-specific, industry-specific and macroeconomic determinants of bank profitability indicated that larger banks benefit from economies of scale and greater resource mobilization, positively affecting ROE.

3.4. Ethical Consideration

Ethical considerations were applied throughout the research process. The data collected from the selected commercial banks was treated with strict confidentiality. This research adheres to key ethical standards to ensure integrity, transparency, and respect for all institutions involved. Data used in the study were collected from publicly available and authorized secondary sources, including annual reports and from selected banks' headquarters, ensuring no breach of confidentiality or privacy. The research avoids any form of data manipulation, misrepresentation, or plagiarism. Additionally, appropriate credit has been given to all scholarly work referenced.

3.5 Operationalization of Study Variables

Figure 3. 1 Definitions, Notation and Expected Sign of the Study Variables

	Variables	Notations	Measurement	Expected Result
Dependent Variable	Return on Equity	ROE	Log of Net Income after Tax/ Average shareholder's equity	
Independent Variables	Number of debit card users	NDCU	Natural log of debit card users	+
Independent Variables	Value of ATM transactions	VATMT	Log of value of ATM transactions	+
Independent Variables	Value of POS transactions	VPOST	Log of value of POS transactions	+
Independent Variables	Number of mobile banking users	NMBU	Log of number of mobile banking users	+
Independent Variables	Value of mobile banking transactions	VMBT	Log of value of mobile banking transactions	+
Independent Variables	Value of internet banking transactions	VIBT	Log of value of mobile banking transactions	+
	Bank Size	BS	Natural log of Banking Transactions	+

Source: Compiled by the Researcher

CHAPTER FOUR

Data Analysis and Interpretation

This chapter presents the results and analysis of data of selected Commercial Banks in Ethiopia. The data was analyzed by using Stata 15 econometric software package. The chapter includes descriptive analysis and results, correlation analysis and results, econometric analysis for testing CLRM Diagnostic tests, model estimation specification tests and regression analyses and discussion of the results, and the results are discussed in depth against each of the hypotheses of this study.

4.1. Descriptive Statistics

Table 4. 1 Descriptive Statistics

```
. summarize roe ndcu vatmt vpost nmbu vmbt vibt bs
```

Variable	Obs	Mean	Std. Dev.	Min	Max
roe	24	1.365415	.0954199	1.147058	1.5214
ndcu	24	20.14845	3.000201	14.76843	24.64926
vatmt	24	12.36133	1.840317	9.2354	15.254
vpost	24	6.265619	.6418961	5.45821	7.769353
nmbu	24	8.695721	1.840597	5.033146	11.68473
vmbt	24	12.25467	1.153369	11.0004	14.46708
vibt	24	13.9544	3.721608	10.235	26.20484
bs	24	19.32804	3.445777	16.41	27.99315

Source: STATA15 result descriptive statistics

Table 4.1 provides a summary of the descriptive statistics of the dependent and independent variables for eight commercial banks from the year 2022 to 2024 with a total of 24 observations.

The table illustrates the mean, minimum, maximum, standard deviation and number of observations for the dependent variable Return on equity (ROE) and independent variables: Number of debit cards (NDCU), Value of ATM transactions (VATMT), Value of POS transactions (VPOST), Number of mobile banking users (NMBU), Value of mobile banking transactions (VMBT), Value of internet banking transactions (VIBT) & Bank size (BS).

A small standard deviation indicates that the values in a statistical data set are close to the mean of the data set, and a large standard deviation means that the values in the data set are farther away from the mean.

The table above shows that the mean value (MV) of ROE of commercial banks was around 1.36 percent for the sampled commercial banks in Ethiopia which implied that the sampled banks on average earned 1.36 percent of each Birr invested in equity. The banks' ROE growth fluctuates on average between 1.52 percent and 1.15 percent, which means the most profitable bank among the sampled banks earned 1.52% of profit after tax for a single Birr invested in the equity of the firm. On the other hand, the least profitable bank of the sampled banks earned 1.15 % of profit after tax for each Birr invested in the Equity of the firm. The standard deviation for ROE was 0.095, indicating low variability among the observations.

4.1.2. Descriptive Statistics Result Interpretation with the Independent Variables

As for the explanatory variables of the model, the MV of the number of debit card users (NDCU) was 20.15 percent & the standard deviation was 3, while the maximum and minimum numbers of debit card users were 24.65% and 14.77% respectively, which showed strong variability.

The MV of the banks' value of ATM transactions (VATMT) over the study period was 12.36 percent & the standard deviation was 1.84 percent indicating moderate variability in the data with the maximum & minimum being 15.25 % and 9.23 % respectively.

The MV of the banks' value of POS transactions (VPOST) over the period under study was 6.23 percent; the standard deviation was 0.64 percent with maximum 7.77 %, and minimum 5.46 % which showed low variability.

The MV for the number of mobile banking users was 8.70% with a standard deviation of 1.84 & had 11.68% & 5.03% maximum & minimum values respectively, indicating some degree of variability among observations.

The MV of the banks' value of mobile banking transactions (VMBT) was 12.25 percent; the standard deviation was 1.15 percent indicating moderate variability where the maximum and minimum number of mobile banking transactions were 14.47 % and 11 % respectively which showed that there is moderate variation among observations.

The MV of value of internet banking transactions (VIBT) is 13.95 % with a standard deviation of 3.72% & with maximum 26.20 %, and minimum 10.23 %, showing high variability among variables.

The MV of the firms' Bank Size of the sample 8 banks was 19.33 % as measured by return on equity. The SD was 3.45 while 27.99% and 16.41% were the maximum and minimum numbers, indicating the values of bank size showed high variability.

4.2 Correlation Analysis

Table 4. 2 Correlation Analysis

```
. corr roe ndcu vatmt vpost nmbu vmbt vibt bs
(obs=24)
```

	roe	ndcu	vatmt	vpost	nmbu	vmbt	vibt	bs
roe	1.0000							
ndcu	-0.2933	1.0000						
vatmt	0.0200	-0.1986	1.0000					
vpost	0.5135	-0.1329	0.1280	1.0000				
nmbu	0.3781	0.3898	-0.4639	0.0589	1.0000			
vmbt	-0.2282	-0.0193	0.1211	-0.2150	-0.1730	1.0000		
vibt	-0.1000	-0.1335	0.5600	0.0608	-0.2120	0.5639	1.0000	
bs	0.6694	-0.4946	0.0189	0.5009	-0.1128	0.0438	0.0330	1.0000

Source: STATA15 result for correlation matrix

Correlation analysis is a statistical technique which measures the strength and direction of a relationship between two or more variables. It tells whether variables are related and how they are related without demonstrating a cause & effect connection. It is used universally in research

across many areas of studies like social sciences, business, and healthcare. Correlation analysis supports researchers uncover statistical patterns and interdependencies in datasets. (Hassan, 2024)

It assesses the connection between variables to figure out whether they move together (positively or negatively) and the strength of their relationship. The outcomes are illustrated as a correlation coefficient, which ranges from -1 to +1: +1: Perfect positive correlation (variables increase together). 0: No correlation (variables are independent). -1: Perfect negative correlation (one variable increases as the other decreases) (Hassan, 2024). The above correlation matrix table 4.2 showed the relationship between the dependent variable and independent variables, and between each independent variable used in this study.

4.2.1 Correlation Analysis Result Discussions between Dependent and Independent Variables

As shown in table 4.2, ROE is negatively correlated with the number of debit card users, value of mobile banking transactions & value of internet banking transactions. ROE had positive relations with the other 4 variables where it had the strongest correlation with Bank size with a correlation coefficient of 0.6694. As Bank Size increases, ROE also tends to increase as a result of having a correlation coefficient close to 1. ROE had a moderate positive correlation with the value of POS transactions & number of mobile banking users with a coefficient of correlation of 0.5135 & 0.3781 respectively. The coefficient of correlation between Return on Equity and value of ATM transactions is 0.02, showing a weak positive correlation. The result showed that ROE had a negative correlation with number of debit card users, value of mobile banking transactions & value of internet banking transactions having a correlation coefficient of -0.2933, -0.2282 & -0.1 respectively suggesting that as the value of the three independent variables increase, ROE tends to decrease.

Overall, while examining the coefficients of correlation, value of ATM transactions, value of POS transactions, number of mobile banking users & bank size had a positive or direct relationship with return on equity (ROE) of commercial banks, which suggested that, an increase in these independent variables would result in an increase in ROE and a decrease in these explanatory variables would result in a decrease in ROE of commercial banks in Ethiopia

whereas the other three explanatory variables; the number of debit card users , the value of mobile banking transactions & value of internet banking transactions have negative relations since these variables had a negative coefficient and had an inverse relation with return on equity (ROE) of commercial banks in Ethiopia.

According to table 4.2, the number of debit card users was negatively correlated with all variables except number of mobile banking users. It had a moderate negative correlation with bank size with a correlation coefficient of -0.4946, whereas it had a weak negative correlation with the other variables. The value of ATM transactions had a moderate positive correlation with the value of internet banking transactions & moderate negative correlation with the number of mobile banking users with correlation coefficient of 0.56 & -0.4639 respectively whereas it had a weak positive relationship with the other variables. The value of POS transactions had a weak negative correlation with the value of mobile banking transactions & had a moderate positive correlation with bank size.

Number of mobile banking users had weak negative correlation with the value of mobile banking transactions, value of internet banking transactions & bank size with a correlation coefficient of -0.1730, -0.2120 & -0.1128.

The value of mobile banking transactions had a moderate positive correlation with the value of internet banking transactions & weak positive correlation with bank size having coefficient of correlation of 0.5639 & 0.0438 respectively. The value of internet banking transactions had a weak positive correlation with bank size with a correlation coefficient of 0.0330.

4.3 Classical Linear Regression Model (CLRM) Assumptions and Diagnostic Test

The Classical Linear Regression Model (CLRM) depends on assumptions of homoscedasticity, normality, autocorrelation & multicollinearity, which can be tested using various statistical methods such as Durbin-Watson test, VIF, Breusch-Pagan test, Shapiro-Wilk test, and Hausman test.

The researcher conducted diagnostic tests to check the possibility of errors. The results of the tests are presented in the following sections.

4.3.1 Test for Normality

4.3.1.1 Skewness/Kurtosis Tests for Normality

The STATA results for the tests of Skewness/Kurtosis presented in Table 4.3 shows that the researcher failed to reject the null hypothesis as the P-value is quite high both for Skewness (0.7126) and Kurtosis (0.3923) and the joint test (0.93), which is greater than the level of significance 0.05 and this implied that the data was consistent with a normal distribution assumption. As shown in the table below the ROE variable is normally distributed, as indicated by the high p-values for both skewness and kurtosis, as well as the joint test.

Table 4. 3 Skewness/Kurtosis test

```
. sktest uhat
```

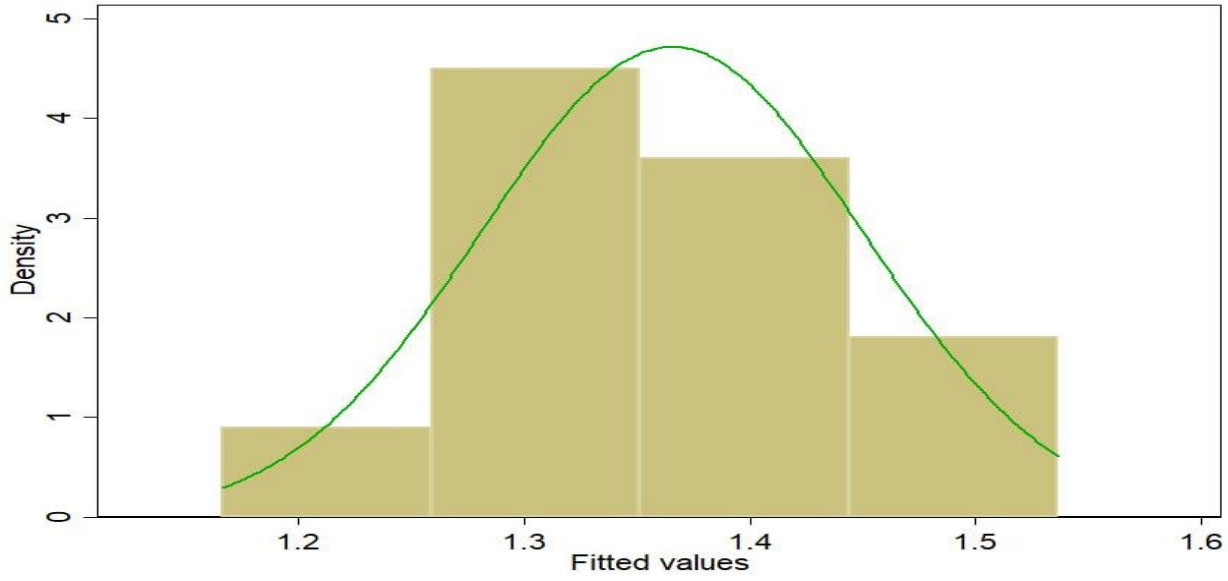
Skewness/Kurtosis tests for Normality

				joint	
Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	Prob>chi2
uhat	24	0.7126	0.3923	0.93	0.6287

Source: STATA15 result for Skewness/Kurtosis test

4.3.1.2 Test for Histogram

Figure 4. 1: Histogram for Residual



Source: STATA15 Histogram Graph

4.3.1.4 Test for Heteroscedasticity

Table 4. 4 Heteroskedasticity Test

```
. estat imtest, white

White's test for Ho: homoskedasticity
          against Ha: unrestricted heteroskedasticity

          chi2(23)      =     24.00
          Prob > chi2   =    0.4038

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	24.00	23	0.4038
Skewness	3.16	7	0.8697
Kurtosis	1.55	1	0.2125
Total	28.72	31	0.5841

Source: STATA15 result for white's test

This study used the white test to examine the presence of heteroskedasticity across the range of explanatory variables. In table 4.4 above the p-value in white's test of heteroskedasticity was 0.4038, since the *p*-value was considerably more than 0.05, the researcher couldn't reject the null hypothesis of homoskedasticity which implied that there was no significant evidence for the presence of heteroskedasticity.

4.3.1.5 Test for Multicollinearity

Table 4. 5 Multicollinearity Test

```
. vif
```

Variable	VIF	1/VIF
vibt	2.49	0.402241
vatmt	2.05	0.487606
bs	1.95	0.513509
vmbt	1.92	0.521231
vpost	1.64	0.608697
ndcu	1.64	0.609918
nmbu	1.57	0.637688
Mean VIF	1.89	

Source: STATA15 result for multicollinearity test

The above table 4.5 shows how much the variance of the estimated regression coefficients is increased due to multicollinearity. A VIF of 1 indicates no correlation between the variables while a VIF between 1 & 5 indicates moderate correlation between the variables and a VIF above 5 indicates a potential problem of multicollinearity. The highest VIF value of this model is 2.49, which indicates a moderate correlation & is acceptable. The mean VIF is 1.89 suggests that there is no significant multicollinearity between the variables.

4.3.1.5 Test for Autocorrelation

Table 4. 6 Autocorrelation Test

```
. gen time=_n

. tsset time
        time variable:  time, 1 to 24
                delta:  1 unit

. dwstat

Durbin-Watson d-statistic(  8,    24) =  2.758849
```

Source: STATA15 result for autocorrelation test

The Durbin-Watson (DW) statistic is a test statistic used to detect the presence of autocorrelation (a relationship between values separated from each other by a given time lag) in the residuals from a regression analysis. The Durbin-Watson table provides the critical values for the DW test for a given sample & number of independent variables. These critical values help determine whether the observed DW statistic indicates significant autocorrelation. (Bobbit, 2019)

As per the DW table in the figure above for 24 observations with seven explanatory variables, the lower and upper values are 0.439 and 2.255 respectively and the Durbin-Watson test statistic of 2.76 is clearly not between these values thus there is no evidence for the presence of autocorrelation.

4.4. Model Estimation Specification Test

The Hausman test was used to decide whether the random effects model is appropriate or if the fixed effects model should be chosen by testing if the individual effects are correlated with regressors or not where we choose fixed effects model in the first case & we choose random effects model in the latter.

Table 4. 7 Hausman test result

```
. hausman fe re

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |       fe           re         Difference          S.E.
-------------+------------------------------------------------------------
        ndcu |   -.0142576    -.0057213       -.0085363        .0050746
       vatmt |    .0242745     .0186337        .0056408        .0185929
       vpost |     .042315     .0148683        .0274466               .
        nmbu |   -.0075592     .0325057       -.0400649        .0149227
        vmbt |    .0180022    -.0058821        .0238842         .011434
        vibt |   -.0082829    -.0045696       -.0037134        .0050677
          bs |    .2504693     .0167064        .2337629        .0762867
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =        4.35
                Prob>chi2 =      0.7388
                (V_b-V_B is not positive definite)
```

Source: STATA15 result for Hausman test

Hausman Test Hypothesis

H0: Random effect model is appropriate.

H1: Fixed effect model is appropriate.

Decision Rule: Reject H0 if P value is less than significant level 0.05. Otherwise, do not reject H0.

According to Table 4.7, the appropriate model of panel data for the effect of digitalization on the financial performance of Commercial Banks measured by ROE was Random effect estimation model as the p value is more than 5% which is 0.7388 hence, the null hypothesis isn't rejected.

4.5 Results of Regression Analysis

4.5.1 Operational Model

ROE= β0+β1 (NDCU,t) + β2(VATMT,t) +β3(VPOSTi,t) + β4(NMBUi,t) + β5(VMBTi,t) + β6(VIBTi,t) +β7(BSi,t) + Є i,t

Table 4. 8 Random Effect Model Regression Results

```
. xtreg roe ndcu vatmt vpost nmbu vmbt vibt bs, re

Random-effects GLS regression                   Number of obs     =         24
Group variable: banks                           Number of groups  =          8

R-sq:                                           Obs per group:
     within  = 0.5919                                         min =          3
     between = 0.9406                                         avg =        3.0
     overall = 0.7863                                         max =          3

                                                Wald chi2(7)      =      58.87
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =     0.0000
```

roe	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ndcu	-.0057213	.0047064	-1.22	0.224	-.0149458	.0035031
vatmt	.0186337	.0085812	2.17	0.030	.0018148	.0354526
vpost	.0148683	.0220197	0.68	0.500	-.0282895	.0580262
nmbu	.0325057	.0075026	4.33	0.000	.0178008	.0472106
vmbt	-.0058821	.0132432	-0.44	0.657	-.0318383	.0200741
vibt	-.0045696	.004672	-0.98	0.328	-.0137265	.0045874
bs	.0167064	.004466	3.74	0.000	.0079533	.0254595
_cons	.6874808	.2537525	2.71	0.007	.190135	1.184827
sigma_u	0					
sigma_e	.0425584					
rho	0	(fraction of variance due to u_i)				

Source: STATA15 result for random effect regression

ROE= β0+β1 (NDCU,i,t) + β2(VATMTi,t) +β3(VPOSTi,t) + β4(NMBUi,t) + β5(VMBTi,t) + β6(VIBTi,t) +β7(BSi,t)+ Є i,t

ROE= 0.69–0.01NDCU + 0.02VATMT +0.01VPOST +0.03NMBU -0.01VMBT– 0.00VIBT+ 0.02BS + Є ,t

Table 4.8 above showed random effect estimation on 24 observations taken from 8 commercial banks over three years period from 2022 to 2024 with balanced panel data. The R^2, for the model was 0.79% which was very good which means variation in return on equity (ROE) of commercial banks in Ethiopia was 79% explained by the independent variables in the model. The remaining 21% variation in return on equity (ROE) of commercial banks in Ethiopia was not explained by the explanatory variables used in this model & it was explained by other variables which were not included in the model. And, over all test of significance (Prob> chi2 was 0.0000) which showed statistical significance of the coefficients and indicated that the overall model was statistically significant since p-value was 0.000 which was below 5%.

According to random effect estimation of the model out of seven explanatory variables three of them had a statistically significant impact on financial performance. Among the significant variables, the number of mobile banking users and bank size were significant at 1% since the p-values for these variables were 0.000. Value of ATM transactions was significant at 5% with p-value of 0.03

The panel random effect estimation regression results in the above table 4.8 also showed that, the coefficient intercept (β0) was 0.69 which indicated that, when all explanatory variables had a value of zero, the average value ROE would have a 0.69 unit and be statistically significant at 1% level of significance.

4.5.2 Interpretations on Regression Results and Research Hypothesis

This section discusses in detail the analysis of the results for each explanatory variable.

4.5.2.1 Number of Debit Card Users Return on Equity

The variable used to measure the number of debit card users is natural logarithm for the number of debit card users. The result of random effect regression model in table 4.8 above indicated that number of debit card users was not significant with P-value of 0.224 and had a coefficient of -0.0057. Holding other variables constant, when the number of debit card users increased by one percent, return on equity (ROE) of sampled commercial banks would decrease by 0.0057 and statistically insignificant even at 10% level of significant. There was insignificant negative relationship between the number of debit card users (NDCU) and return on equity (ROE) of sampled Ethiopian commercial banks. Therefore, the researcher rejected the null hypothesis that there was a positive relationship between NDCU and ROE, as there was no sufficient evidence to support the positive relationship. The explanation for this could be the existence of many inactive cards held by customers.

However, many previous studies, for instance Mengist & Tilahun (2024), Damtew (2014), Alemayehu (2020) & Worku (2016) stated that NDCU had significant positive effects as measured by both ROA & ROE and concluded that debit cards improved profitability of banks. According to Mutua (2011), this is due to the increase in debit card users would have a strong impact on customer satisfaction and customers can access their account at any time and as a result banks get more return as a fee charge increase where the researcher of this study found results that differ from these researchers.

4.5.2.2 Value of ATM Transactions and Return on Equity

The proxy used to measure the value of ATM transactions is a logarithm of the value of ATM transactions. The result of random effect regression model in table 4.8 above indicated that the value of ATM transactions had coefficient of 0.02 and its P-value was 0.030. Holding other variables constant, when the value of ATM transactions increased by one percent, return on

equity (ROE) of sampled commercial banks on average would increase by 0.02 percent and is statistically significant at 5% significance level (p-value= 0.030) which indicated there was a positive significant relationship between value of ATM transactions and ROE therefore, the researcher failed to reject the null hypothesis that value of ATM transactions had a positive significant role on return on equity of commercial banks in Ethiopia. Referring to previous studies, the result was consistent with the findings of Hailu (2020) Alemayehu (2020), Mekonnen (2022) & Girma (2019). According to those researchers the value of ATM transactions had a positive and significant role in return on equity. The plausible reason for the significant positive relationship could be that as there are more transactions executed by ATM; more commissions would be generated by commercial banks. The researches of Worku (2020) & Mesfin (2023) were different from that of the researcher where the researchers stated the reason for this result was that commercial banks have high transaction fees for ATM usage & longer queues as there is limited ATM infrastructure inconveniencing customers, which suggested the need for further studies regarding this matter.

4.5.2.3 Value of POS Transactions and Return on Equity

The proxy used to measure the value of POS transactions (VPOST) is a logarithm of value of POS transactions. The result of random effect regression model in table 4.8 above indicated that the coefficient of value of POS transactions was 0.01 and its P value was 0.5. Holding other variables constant, when the value of POS transactions (VPOST) increased by one percent, return on equity (ROE) of sampled Ethiopian commercial banks on average would increase by 0.01 percent and is statistically insignificant. This result was consistent with the previous researchers' study including Alemayehu (2020) & Worku (2016) where studies by Hailu (2020) & Mesfin (2023) had indicated that the value of POS transactions had a positive effect on performance as an increase in the use of POS machines raises the availability & coverage of commercial banks. The likely reason for the insignificance in this study could be that POS terminals are not available in all places, especially rural areas therefore, the researcher failed to accept the null hypothesis.

4.5.2.4 Number of Mobile Banking Users and Return on Equity

The proxy used to measure the number of mobile banking users (NMBU) is a logarithm of the number of mobile banking users. The result of random effect regression model in table 4.8 above indicated that the coefficient of the value or price of transactions executed by mobile banking was 0.03 with p-value 0.000. The result indicated that there was significant positive relationship between number of mobile banking users (NMBU) and return on equity (ROE) of sampled Ethiopian commercial banks. Therefore, the researcher failed to reject the null hypothesis that there was positive relationship between NMBU and ROE. Holding other variables constant, when the number of mobile banking users increased by one percent, return on equity (ROE) of sampled commercial banks on would increase by 0.03 percent and statistically significant at 1% significance level. This result was consistent with the findings of Mengist & Tilahun (2024).

4.5.2.5 Value of Mobile Banking Transaction and Return on Equity

The proxy used to measure the value of mobile banking transactions (VMBT) is a logarithm of the value of mobile transactions. Table 4.8 shows that the coefficient of the number of mobile banking transactions (VMBT) was -0.004 with p-value of 0.66. In other words, there was a negative relationship between VMBT and return on equity (ROE) of commercial banks under study & the relationship was not statistically significant even with significance level of 10%. Therefore, the researcher rejected the null hypothesis that there was positive significant relationship between VMBT and ROE, as the regression result showed there is no evidence to support the significant positive relationship between NMBT and ROE. The result was consistent with the findings Girma (2019) & Mekonnen (2022).

4.5.2.6 Value of Internet Banking Transactions and Return on Equity

The proxy used to measure the value of internet banking transactions (VIBT) is a logarithm of the value of internet transactions. The result of random effect regression model in table 4.8 above indicated that the coefficient of the value of internet banking transactions was -0.00456 with p-

value of 0.328 and there was insignificant negative or indirect relationship between value of internet banking transactions (VIBT) and return on equity (ROE) of sampled Ethiopian commercial banks. Therefore, the researcher rejected the null hypothesis that there was a significant positive relationship between VIBT and ROE, as there was no sufficient evidence to support the positive relationship between VIBT and ROE.

4.5.2.7 Bank Size and Return on Equity

The proxy used for bank size is the natural logarithm of total asset. The result of random effect regression model in table 4.8 above showed that the coefficient of bank size was 0.02 and its P-value was 0.000. While holding other variables constant, when the bank size (BS) increased by one percent, return on equity (ROE) of sampled commercial banks would decrease by 0.02 percent and is statistically significant at 1% level of significance.

The result indicated that a positive relationship had existed implying that larger commercial banks tend to earn higher profits than smaller commercial banks.

Figure 4. 2. Summary of Variables, Hypothesis Test and Decisions

Explanatory Variables	Expected Sign	Actual Sign	Decision
Number of Debit Card Users	Positive & Significant	Negative & Insignificant	Rejected
Value of ATM Transactions	Positive & Significant	Positive & Significant	Failed to reject
Value of POS Transactions	Positive & Significant	Positive & Insignificant	Rejected
Number of Mobile Banking Users	Positive & Significant	Positive & Significant	Failed to reject

Value of Mobile Banking Transactions	Positive & Significant	Negative & Insignificant	Rejected
Value of Internet Banking Transactions	Positive & Significant	Negative & Insignificant	Rejected
Bank Size	Positive & Significant	Positive & Significant	Failed to reject

Source: Compiled by the Researcher

CHAPTER FIVE

SUMMARY OF MAJOR FINDINGS, CONCLUSION AND RECOMMENDATION

The purpose of this chapter is to discuss the major findings of the study, conclusions and recommendations of the study. The chapter is organized into three sections; the first section presents the conclusions of the study; the second section presents the recommendations of the study and lastly a further research area is presented.

5.2 Summary of the study findings

The study aimed to assess the effect of digitalization on the financial performance of Ethiopian commercial banks, specifically focusing on the period from 2022 to 2024. Using a balanced panel dataset of eight purposively selected commercial banks and 24 observations, the analysis employed descriptive statistics and a random effects panel regression model. Return on Equity (ROE) was used as the main indicator of financial performance, regressed against several digitalization variables such as the number of debit card users, value of ATM transactions, value of POS transactions, number of mobile banking users, value of mobile banking transactions, and value of internet banking transactions, with bank size as a control variable.

The findings revealed that the value of ATM transactions, number of mobile banking users, and bank size had a statistically significant and positive effect on ROE, indicating that these digitalization elements contribute positively to bank profitability. On the other hand, the number of debit card users, value of mobile banking transactions, and value of internet banking transactions showed a negative but statistically insignificant effect on ROE. Additionally, the value of POS transactions had a positive yet insignificant impact. These results suggest that not all aspects of digitalization equally influence financial performance, and banks may benefit more by strategically investing in and promoting services that show stronger links to profitability, such as ATM and mobile banking platforms.

The reason for the insignificant & negative relationship between the number of Debit Card Users could be attributed to low usage frequency as many customers may hold debit cards but rarely

use them for transactions, especially due to limited awareness or trust in digital payments, high operational costs by maintaining ATM networks and issuing debit cards involves costs that may not be offset by sufficient transaction volume, thereby reducing profitability and the existence of inactive accounts where some users may not actively engage with their cards, resulting in minimal contribution to income but continued servicing costs.

The plausible reason for the insignificant & negative relationship between the Value of Mobile Banking Transactions could be low transaction fees of mobile banking in Ethiopia that may generate limited fee income, technical Challenges such as connectivity issues, system downtimes, or poor user experience may limit transaction volume or affect customer trust & limited monetization where most mobile transactions are balance checks, fund transfers, or bill payments with no associated fees, they may not significantly boost ROE.

The reason for the insignificant & negative relationship between Value of Internet Banking Transactions could be the low adoption rates where internet banking penetration in Ethiopia is still low compared to mobile banking, partly due to internet access limitations, business-oriented usage as internet banking is often used by corporate clients for large but infrequent transactions, which may not significantly affect profitability & the high setup costs where the initial investment in internet banking infrastructure may outweigh short-term gains, reducing its immediate impact on ROE.

The possible reason for the existence of a Positive but insignificant Impact association between the Value of POS Transactions & ROE could be the limited POS network where many merchants may not yet accept card payments due to a small POS terminal network, especially in rural or semi-urban areas, the consumer in Ethiopia is still heavily cash-dependent & even when POS systems are available, customers may prefer cash transactions & the revenue lag might take time for POS transactions to generate meaningful revenue or cost savings that influence ROE.

The insignificant and sometimes negative effect of these digitalization variables on ROE may reflect a lag between digital adoption and financial return. While digital platforms are being rolled out, their impact on profitability depends on user adoption, transaction volume, cost efficiency, and monetization strategies all of which are still evolving in the Ethiopian banking context.

5.2 Conclusion

The main aim of this research was to assess the effect of digitalization on the financial performance of commercials banks in Ethiopia for the period 2022 to 2024. A balanced panel data of eight purposively selected commercial banks with 24 observations has been used for analysis. The sample data of eight commercial banks has been analyzed using descriptive statistics and random effect panel regression model. The dependent variable used as a financial performance indicator was return on equity. ROE was calculated as net income after tax divided by average stockholders' equity. The dependent variable is regressed with independent variables such as: number of debit card users, value of ATM transactions, value of POS transactions, number of mobile banking users, value of mobile banking transactions and value of internet banking transactions from bank specific variables which were used as a indicator of digitalization while bank size (BS) was the control variable.

The findings of the study indicated that, value of ATM transactions, number of mobile banking users & Bank Size had a significant and positive effect on ROE of Ethiopian banks. In contrast, the number of debit card users, value of mobile banking transactions & value of internet banking transactions had an insignificant negative impact on ROE whereas the value of POS transactions had a positive insignificant impact which means these four variables did not have an influence on the ROE of commercial banks.

5.2 Recommendations

The findings of the study indicated that the value of ATM transactions, the number of mobile banking users & bank size were the significant factors of financial performance of commercial banks in Ethiopia during the years from 2022 to 2024. Therefore, the researcher has proposed the following initiatives that could further enhance the economic performance of commercial banks, focusing on these variables:

1. Strategic Focus on High-Impact Digital Services

Given that the value of ATM transactions, number of mobile banking users, and bank size showed a statistically significant and positive effect on Return on Equity (ROE), commercial

banks in Ethiopia are encouraged to prioritize investment in these areas. Banks should expand and optimize their ATM networks to ensure accessibility, reliability, and high transaction capacity. Simultaneously, mobile banking platforms should be further enhanced with user-friendly interfaces, broader functionalities, and improved security features to boost user adoption and engagement. Increasing mobile banking literacy through awareness campaigns could also help maximize the profitability potential of this channel.

2. Reevaluate and Improve Underperforming Digital Channels

The study revealed that some digital services—such as debit card usage, mobile banking transaction value, and internet banking—had negative or insignificant effects on financial performance. To address this, banks should investigate the root causes behind low usage or monetization. For debit cards, improving customer education on card benefits, incentivizing frequent use, and addressing issues of trust and inactivity could enhance effectiveness. For mobile and internet banking, banks should explore ways to increase transaction value by introducing tiered service packages, adding paid features, or encouraging higher-value transactions. Technical reliability, service availability, and user support should also be strengthened to reduce drop-offs and build trust.

3. Expand POS Infrastructure and Encourage Digital Payment Culture

Despite showing a positive but insignificant effect, POS transactions hold untapped potential for profitability. To enhance their impact, banks should collaborate with merchants, especially in underserved regions, to expand the POS terminal network and offer incentives for both businesses and customers to adopt digital payments. Additionally, public-private partnerships and regulatory support may be needed to promote a shift from cash to digital payments. Consumer education campaigns emphasizing the convenience, safety, and rewards of using POS systems can also play a crucial role in gradually changing spending habits and increasing transaction volumes, thereby contributing more significantly to ROE in the long term.

5.3 Limitations & Further Research Consideration

This research can serve as a basis for future researchers who aim to explore related topics. The sample used for the study may not be sufficient & the independent variables that the researcher discussed are not the only digital banking variables that can affect financial performance, therefore, future researchers are encouraged to include additional digitalization factors that may influence ROE such as the effects of agent banking users & transactions.

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Appendix I

Data for E- Banking and Financial Performance

Banks	Years	ROE	NDCU	VATMT	VPOST	NMBU	VMBT	VIBT	BS
CBE	2022	1.480725	15.10125	10.2153	6.908242	6.535833	11.94985	10.598	27.77734
CBE	2023	1.492062	15.3326	12.235	7.027426	7.924036	12.27696	10.2365	27.8979
CBE	2024	1.5214	16.54627	15.254	7.16655	8.232541	14.46708	26.20484	27.99315
BoA	2022	1.307496	17.58981	13.19938	5.644736	6.762875	11.23365	10.4036	18.82248
BoA	2023	1.361539	18.41358	14.2767	6.102159	7.133759	11.0004	11.42634	19.05996
BoA	2024	1.470557	18.97132	15.07519	6.319148	7.301953	11.43114	12.26146	19.2732
UNITED	2022	1.20412	21.47414	11.235	5.654307	9.667038	12.258	12.222	18.02629
UNITED	2023	1.431364	21.37045	11.254	7.769353	10.24371	11.0021	10.235	18.22931
UNITED	2024	1.447158	14.76843	11.025	5.82801	10.48034	11.44035	12.365	18.47478
AWASH	2022	1.401401	23.61367	12.369	6.353048	11.30342	11.2367	14.265	19.02713
AWASH	2023	1.456366	23.80515	12.554	6.394884	11.4722	11.258	12.365	19.22726
AWASH	2024	1.478566	24.64926	10.235	6.465729	11.68473	11.49272	10.2354	19.56983
DASHEN	2022	1.294687	22.46852	9.2354	5.951144	9.059254	12.2335	10.2654	18.57891
DASHEN	2023	1.324899	22.75174	9.2365	6.014689	10.27814	13.254	11.365	18.78976
DASHEN	2024	1.426674	23.31757	10.2548	6.0649	10.71893	11.3799	12.235	19.09135
OROMIA	2022	1.290257	20.93268	14.59878	5.564665	6.745846	14.2358	15.335	17.76762
OROMIA	2023	1.309204	21.59734	14.99594	7.744702	7.195035	12.2365	16.35465	17.99624
OROMIA	2024	1.333447	21.94663	15.19163	5.947286	7.305117	11.233	16.83051	18.30077
WEGAGEN	2022	1.287354	20.55	12	5.45821	6.582962	13.36	15.04388	16.41
WEGAGEN	2023	1.304275	20.15	12.5	5.650659	9.110857	14.1225	16.17352	16.62
WEGAGEN	2024	1.337858	20.99	12.55	5.735725	9.844527	14.256	16.83447	16.75
GLOBAL	2022	1.147058	21.58925	12.02	6.013301	5.033146	12.235	16.99	16.46066
GLOBAL	2023	1.308351	20.52211	12.54808	6.240225	8.912639	13.265	17.11	16.75224
GLOBAL	2024	1.353147	15.11103	12.61328	6.355758	9.168402	11.254	17.55	16.9767