The Effect of Digitalization on the Financial Performance of Private Commercial Banks Ethiopia

By

Melese Abraham Agago

Hawassa University

Collage of Business and Economics

Department of Accounting and Finance

March ,2024

Hawassa, Ethiopia

The Effect of Digitalization on the Financial Performance of Private Commercial Banks in Ethiopia

By

Melese Abraham Agago

ID No:AcFnW/0021/14

The Thesis is submitted to the Hawassa University School of Graduate Studies in Partial fulfillment of the requirements for the Award of Degree of Master of Science in Accounting and Finance

Principal - Advisor: Tamirat Ludego (PhD)

CO-Advisor : Tewodros Solomon (MSc)

Collage of Business and Economics

School of Management and Accounting and Finance

March /2024

Hawassa Ethiopia

STATEMENT OF DECLARATION

I, declare that this thesis entitled "The Effect of Digitalization on the Financial Performance of Private Commercial Banks in Ethiopia" is my original work, which has not been presented for a degree in this or any other universities and that all sources of materials used for the thesis have been properly acknowledged.

	Signature	Date
Declared by: Melese Abraham	_____	_____

SCHOOL OF GRADUATE STUDIES

HAWASSA UNIVERSITY

ADVISORS APPROVAL SHEET

I hereby certify that the thesis entitled**: "The Effect of Digitalization on the Financial Performance of Private Commercial Banks in Ethiopia: "** submitted in partial fulfillment of the requirements for the Degree of Master of MSc in Accounting and Finance ,the graduate program of the school of management and accounting ,and has been carried out by Melese Aabraham Agago ID .NO AcFnW/0021/14,under our supervision .Therefore ,We recommend that student has fulfilled the requirements and hence hereby can submit the thesis to the school of management and accounting .

	Name	Signature	Date
Principal advisor:	----------	----------	----------
Co-Advisor:	----------	----------	----------

SCHOOL OF GRADUATE STUDIES

HAWASSA UNIVERSITY

EXAMINERS APPROVAL SHEET

We, the undersigned, members of Board of examiners of the final defense by **Melese Abragham** have read and evaluated his thesis entitled "**The effect of digitalization on the financial performance of private commercial banks Ethiopia** '' and examined the candidate. This is, therefore, to certify that the thesis has been accepted in partial fulfillment of the requirement for the degree MSc in Accounting and finance. I the undersigned have agreed to examine his thesis under conditions stated above.

Name major adivisor

Name of chair person

Name of Internal examiner

Name of External examiner

SGS Approval

Stamp of SGS Date----------

ACKNOWLEDGMENTS

First and foremost, I would like to thank God, the Almighty, for making all this possible. I would also like to extend my greatest appreciation to my principal advisor Dr. Tamirat Ludego and Co-advisor Tewodros Solomon (MSc) for their guidance and help. Additionally, I would like to express my gratitude to my family and friends for their continuous support and encouragement throughout my years of study and writing of this thesis. The last but not the list, I would like to express my heartfelt thanks to my fellow graduate Anteneh Doba for his unlimited support in my three years study time .

Table of Contents

LIST OF TABLES

Tables **Page**

LIST OF FIGURES

Acronomy

BOA	Bank of Abyssinia
ATM	Automated Teller Machine
POS	Point of Sale
ITM	Iterative Teller Machine
MW	Mobile Wallet
ROA	Return on Asset
ROE	Return on Equity
NBE	National Bank of Ethiopia
WWW	world Wide Web
PC	Personal Comput
NMBU	Number of Mobile Banking user
GDP	Gross Domestic Product
NIBU	Number of internet banking user
NDCU	Number of debt card user

ABSTRACT

This research examines the effect of digitization on private commercial bank financial performance in Ethiopia, using return on asset as a proxy for financial performance. The study selected 10 private commercial banks operating in Ethiopia between 2017 and 2023 using secondary data. Key variables were determined based on existing literature to reveal their link and effect on commercial bank profitability. Number of mobile banking user, ATM number, number of internet banking user, number of debit card user, and number of POS terminals was the factors studied. The empirical findings of this study disclosed that number of ATM machines, number of POS machines and number of mobile banking users have significant effect on profitability of private commercial banks in Ethiopia. while the number of debit card users and number of internet banking users are insignificant and this revealed that they could not explain as well as could not affect the return on asset or profitability of Ethiopian private commercial banks.The researcher recommend that Private commercial banks should work aggressively on increasing number of active users' as equivalent to expansion of digital technologies by creating awareness to their customers, training employees and series follow ups so as to improve effectiveness and efficiency of their asset. Additionally, private commercial banks should work on integrating their systems. This would enable customers to transfer money via mobile or online to another bank without having to open a bank account at the other bank or go to a bank. By solving the issue of integration problems, the banks should start to increase their profitability.

Keywords: Digitalization; Commercial Banks; ROA; Financial performance; fixed effect model.

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the Study

Information and communication technology (IT) has brought super change on the financial institutions particularly it supports banking service, risk management and increase productivity. Information and communication technology investment has enabled the financial institutions to compute and be successful in digital banking transformation Today .Digital banking is the recent gift of information technology which enable banks to provide artistic service without limitation of time and space through automated teller machines(ATM) ,internet ,mobile banking ,interactive teller machines (ITM) (Shukla, R., 2016).

In the last few decades huge investments have been made by banks in technology to reduce their cost and expenses .Banks are offering digital banking channels such as ATM ,internet banking ,mobile banking digital banking kiosks to deliver best quality service to customers with the expectation of increasing profitability and reducing operating cost (sarel and marmorstein 2003).

Kennedy and Jacky (2013), note that the digital banking technology has greatly advanced there by playing a major role in improving the standards of service delivery in the financial institution sector. Those days are long gone when customers would queue in the banking halls waiting to pay their utility bills, school fees or any other financial transactions. They can now do this at their convenience by using their ATM cards or over the internet from the comfort of their homes. The banking business is rapidly changing. Digital banking is becoming part of our daily lives. And it's the best way to create value for customers.

It allows users to do financial transactions without having to visit a bank. Cheques and other paper transactions are replaced by digital transactions. By presenting the benefits of

digital banking services to clients, advancements in computer, smart phone, internet, information, and communication technologies 2can attract customer's branches, instead of performing routine operations. Although digitalization is a reality for companies and contribute to value creation, few studies have examined its impact on organizations performance in the service sector. (Elsevier, journal of business research 126, 319,-326, and 2021).

According to studies made on digital banking, such as Solomon, W. (2016) and Elias, G. (2019), have been undertaken on the role of e-banking on the financial performance of commercial bank Ethiopia. Other Ethiopian research on the other hand, focused on the acceptance of e-banking, as well as its challenges and prospects in the Ethiopia banking system. Ayana, G. (2010) Barriers and Drivers of e-banking adoption in Ethiopia; Gardachew, W. (2010) on the challenges and opportunities of electronic banking practices in Ethiopia, and Million, (2013) on impact of electronic banking on custom satisfaction.

Digitalization is a ubiquitous influence nowadays, impacting many industries, including the banking sector. Banks are facing tremendous competitive pressure and the need for the development of digital opportunities is urgent to ensure future success. As a result, the question is not if or whether digitization affects the Bank's profitability, but rather how. The way business is done is being challenged, and it must be modified to the changing market conditions. The topic of digitalization has been discussed for more than 20 years, but not until recently banks discovered this topic as present and of strategic relevance. Digitalization in banking along with other factors, such as changing customer experience on digitalization, operational excellence, accessibility option and increasing regulatory frameworks, is a relevant influencing factor for banks. This study therefore,tries to determine how digitalization influence financial performance of private commercial banks in Ethiopia through variables like ATM ,MB,IB ,POS, debit cards and bank size(control variable).

1.2 Statement of the Problem

Digital strategy is a critical component of the overall organizational strategy and should be guided by the business‟ vision, mission, and overall strategy, as well as market conditions. There are three fundamental engagement models for banks: become a digital bank, introduce standalone digital channels or products, or establish subsidiaries to operate digital banking activities. Offering digital financial services does not have to be an all or nothing approach. All three routes to digitization allow institutions to move forward on a digital journey, with large or small investments, taking large or smaller risks (IFC, 2018.

Information and communication technology investment has enabled the financial institutions to compute and be successful in digital banking transformation (Abbasi and Weigand, 2017).Commercial banks in Ethiopia are investing a large amount of capital in digital banking in order to remain in a competitive and dynamic environment (National bank of Ethiopia. (2021).This considerable investment must be used to develop a fully integrated e-banking business. As a result, it is vital that e-banking innovations are founded on a thorough analysis of the costs associated in order to avoid detrimental consequences on bank performance. On the one hand, bank performance is closely tied to the efficiency and effectiveness of electronic banking, yet to avoid losses associated with electronic banking, strict controls and regulations are required (Josiah, A. and Nancy, k. 2012).

Solomon, W. (2016) investigated the role of e-banking on commercial banks' financial performance in Ethiopia. The study selected ten commercial banks operating in Ethiopia between 2013 and 2015 using secondary data and a purposive sampling technique. To determine their link and influence on commercial banks' ROA, the value or price of POS transactions, debit card transactions, the number of automated teller machine terminals, the number of point of sale terminals, and market share were utilized as explanatory variables. The study's findings revealed that all of these factors had a positive and considerable impact on the financial performance of the commercial banks in Ethiopia .Elias, G. (2019) looked at the role of e-banking on commercial bank financial performance in Ethiopia, using return on equity as a proxy for profitability. The study

selected ten commercial banks operating in Ethiopia between 2015 and 2018 using secondary data and a selective sampling technique. 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 identified as explanatory variables to reveal their link and influence on commercial bank financial performance. The study found that the number of mobile banking users and the value of ATM transactions had positive and significant effects on bank profitability as measured by return on equity, indicating that increasing the number of mobile banking users and the value or price of ATM transactions had a positive impact on commercial bank financial performance by making basic financial services more accessible by reducing the time and distance to the nearest bank branch. According to the study, emphasizing and improving on awareness generation, as well as the major internal drivers, could improve e-banking practice and commercial bank performance in Ethiopia.

Other Ethiopian research on the other hand, focused on the acceptance of e-banking, as well as its challenges and prospects in the Ethiopia banking system. Ayana, G. (2010) Barriers and Drivers of e-banking adoption in Ethiopia; Gardachew, W. (2010) on the challenges and opportunities of electronic banking practices in Ethiopia, and Million, (2013) on impact of electronic banking on customer satisfaction.

The impact of digitalization on organization performance has been studied separately but there has been very little research done on the overall “big” picture of the effects. However, the digitalization of society and business is marching forward at an ever increasing speed, calling for more converged research on the phenomenon (Marku kusisto,2017)**.**Although digitalization is a reality for companies and contribute to value creation, few studies have examined its impact on organizations performance in the service sector.(journal of business research126, 319,-326, 2021).

Generally, based on different empirical and theoretical reviews discussed, increasing experience of digital technologies, growing investment of banks on improvement and recruitment of digital technologies necessitate more researches that has to be done on the effect of digitalization on private commercial banks financial performance in Ethiopia to determine whether the banks are benefiting from digital banking technologies as much as

they should and in order to suggest areas of improvement to increase efficiency and effectiveness of digital technologies .

This study therefore; tries to determine how digitalization influences financial performance of private commercial banks in Ethiopia through variables like ATM, MB, IB, POS . And, the result will help the stakeholders to make decision on how wisely to invest more funds on digital banking products and services.

1.3. Objectives of the Study

1.3.1. General objective

The main objective of the study is to determine the effect of digital banking technology on the financial performance of private commercial banks in Ethiopia.

1.3.2. Specific Objectives

The specific objectives of the study include;

1. To examine the effect of mobile banking on the financial performance of private commercial banks in Ethiopia.
2. To evaluate the effect of automated teller machines (ATMs) on the financial performance of private commercial banks in Ethiopia.
3. To examine the effect of point of sale (POS) terminals on the financial performance of private commercial banks in Ethiopia.
4. To determine the effect of debt card on the financial performance of the private commercial banks in Ethiopia.
5. To evaluate the effect of internet banking on the financial performance of private commercial banks in Ethiopia.

1.4. Hypotheses of the study

Based on the objectives of the research and the literatures discussed the following hypotheses are formulated:-

H1: Internet banking has a positive and statistically significant effect on financial performance of private commercial banks in Ethiopia. .

H2: Mobile banking has a positive and statistically significant effect on financial performance of private commercial banks in Ethiopia.

H3: Automated teller machines (ATMs) have a positive and statistically significant effect on financial performance of private commercial banks in Ethiopia.

H4: Point of sale (POS) terminals has a positive and statistically significant effect on ROA of private commercial banks in Ethiopia.

H5: Debt card has a positive and statistically significant effect on ROA of private commercial banks

1.5. Scope and Limitations of the Study

The scope of this study is about the effect of digitalization on the banks' financial performance and limited to private commercial banks in Ethiopia. Ten private commercial banks are chosen based on availability of data and focus on digital technologies. Return on Asset (ROA) was used to measure financial performance of the banks. This measure of profitability is chosen since ROA is the most frequently applied ratio to banks due to the difficulty to accurately construct the cash flow analysis (Maverick, 2021). ATM's, internet banking, mobile banking, debit cards and POS terminals are used as measures of digitalization. Descriptive and explanatory research design was used as the main aim of the study is to describe the effect of digitalization on the financial performance of private commercial banks in Ethiopia.

The data was collected from secondary sources (published annual reports of the banks). Seven years data (2017-2023) of ten private commercial banks were used to identify the

effect of digital banking on the financial performance of private commercial banks in Ethiopia. The study attempts to measures the effect of digitalization on financial performance without inclusions of external determinants such as GDP, inflation and others.

The possible source of limitation of the study is lack of sufficient data and up-to-date literature in the area concerned with Ethiopian context. This will make it harder to compare the results of the study with that of other similar studies conducted in the country

1.6. Significance of the Study

The finding of the study will be of great importance at identifying the impact of digitalization on‟ financial performance "so that enable the decision makers of the case organization (how to wisely invest on digitalization. It also gives a light for policy makers and regulatory bodies in assessing the legal frameworks and policy and procedures on digital regulation and implementation of the services. The study can be used as reference for other researchers and scholars. It can provide additional knowledge of electronic banking and form the basis upon which further research will be done.

1.7. Organization of the Study

The study is organized in the following form: The first chapter is introductory which consists of general background, statement of the research problem, basic research question, research hypothesis, objectives of the study, significance of the study, and delimitation/scope of the study. The second chapter summarized related literature review of theoretical and empirical studies in the study of digital banking and its impact on financial performance. Chapter three is the Methodology part; which contained design of the study, population and sampling techniques of the study, data type and instrument, sources of data collection, and methods of data analysis. Analysis and data interpretations are presented in chapter four. The final chapter presents conclusion, recommendation and area for further study.

CHAPTER TWO

2. LITERATURE REVIEW

2.1. Introduction

This chapter reviews the existing literature on the effect of digital banking on banks profitability. In particular, theoretical review where various theories on digital banking are reviewed, empirical reviews done by previous researchers on effects of digital banking on banks financial performance are reviewed.

2.2 Theoretical Literature Review

The study reviewed different theories to establish the impact of digital banking on bank profitability.

2.2.1. Digitalization

Digitalization is defined as the creation of a new customer experience on the outside and an efficient, effective operating model on the inside, both of which are enabled by digitalization and the underlying technology, processes, and structures. Digitalization largely focused on enhancing the present offering by introducing new, technology-enabled services that would improve client accessibility and value. Mobile apps, e-wallet solutions, online banking, APIs, and personal finance management (PFM) tools are the most well-known examples (Shukla, R., 2016).

Different firms are being pushed to reassess their existing business models and operating methods as a result of new prospects brought on by digitalization, or to focus on finding

fresh market opportunities Bouwman et al. (2019). The way banks and other financial institutions learn about, communicate with, and please clients is changing dramatically as a result of digitalization. Understanding digital client behavior, preferences, choices, likes, dislikes, and stated as well as implicit needs is the first step toward digitalization. (Kamra, 2019).

Digitalization in banking industry can be facilitated through digital enablers mainly includes: Digitalize customer experience; Digitalize products and services; Digitalize organization and Digitalize operations (Shukla, R., 2016).

Digitalize customer experience: Taking full control of customer experience and managing the stated or unstated needs of existing and new customers and develop business model accordingly. Customers can promptly adapt to the digital world expecting seamless multichannel experience and consistent service. They label their experience on three basic issues: How well companies understand their needs; simplicity of doing business; and how delightful it is.

Digitalize products and services: Traditional banking practice has focused on increasing sales targets rather than understanding the needs of customers. Recently, banks are more interested to become customer centric. Digitalization can provide billions of customers with minimum cost and affordable price. To maintain competitive edge in the industry, banks need to develop innovative products and services that meet customer needs.

Digitalize organization: Most banks have not structured their internal organization and governance policy according to the multichannel organization. Most efforts have been made to digitalize the front end while ignoring the back-end impact on the operation. To support the digital banking journey a complete restructure on the existing system required.

Digitalize operations: The digital world becomes possible as customers, competitors and even regulatory agencies fully engaged in the transparency and convenience of anywhere banking system. Banking does not guarantee customer loyalty instead it can identify opportunities by looking at the overall customer life cycle, enabled better customer

service through the practice of digital marketing and customer service strategies and focus on improving customer experiences.

2.2.1 The Application of Digitalization in Business

The use of digital technologies to streamline corporate operations, boost efficiency, and improve customer experience is known as digitalization (Prause, 2020). Customers' need for satisfaction is one of the primary roles of digitization, which is changing as a result of the construction of a more comfortable and prompter contact between the client and the organization. The following are the goals of corporate digitalization:

 Product or service improvement: innovative technologies such as the creation of mobile banking applications on smart phones, online banking, e-wallet and other digital products have made banks to optimize their processes efficiency, its quality, attractiveness, ease of use and delivery to their customers. Automation of production and other internal processes of the company: While significantly reducing costs with the help of new payment modalities and cashless transactions and optimizing production processes to preserve the environment, save human, money and time resources, and also improve the standard of living in general. Increased number of clients: the growth of financial technologies in financial institution particularly in banking sector increase the number of customers in the use of mobile application and online banking losing interest on traditional banking. Digitalization of the financial institutions contributes a great deal on how banks carry out their performance to avoid customer loss

2.2.2. Digital Banking

The act of conducting banking and financial transactions without the use of cash, coin, or bills is known as digital or cashless banking or e-banking(Kamboh and Leghari, 2016). The early stages of the digital banking journey have largely focused on enhancing existing offerings with new, technology-enabled services in order to improve customer accessibility and value. Electronic banking is also known as digital banking, cashless banking, electronic banking, internet banking, online banking, virtual banking, web-based banking, remote electronic banking, phone banking, and so on Pery-Quatey (2018). Digital banking provides the characteristics that will propel banks into a competitive

future by assisting them in identifying new niche markets that will drive innovation and create jobs.

E-bnking is the delivery of a broad range of value-added products and services to bank clients through electronic and telecommunication networks (Steven, 2002). For years, banks have used e-banking platforms to connect with foreign and domestic consumers and do business. Banks began to use electronic channels to receive instructions and provide their products and services to their clients as the WWW (World Wide Web) and the Internet grew in popularity in the latter half of the 1990s. Despite the fact that the content and capabilities of the products and services offered by banks via the internet vary, they are all referred to as Internet banking or E-banking. A customer can use the internet (electronic banking) to access his or her bank account.

2.2.3 Digital Banking Forms

Automated Teller Machines (ATM)

ATM has been around for quite some time now. ATMs are convenient since they are open 24 hours a day, seven days a week, so clients do not have to wait until bank hours to get their money. An automated teller machine (ATM) is an electronic computerized telecommunications device that allows customers of a financial institution to access their bank accounts, order or make cash withdrawals (or cash advances using a credit card), and check account balances without the need for a human bank teller. First, as compared to other e-channels, ATMs are the most well-known and accepted. Bishnoi, S. (2013) ATMs play a major role in enhancing the firm‟s competitive position; since they were first introduced in an attempt to lower bank costs and increase efficiency (AbdEl.Aziz, El Badrawy and Ismail Hussien, 2014). Banks have been positioning ATMs to increase their accessibility. As clients value their time, they would appreciate a reliable ATM that would help them save their time in conducting routine banking activities at their convenience to withdraw and deposit money. ATMs added another benefits regarding their location, because many shopping places, Malls, Hotels, Supermarkets and market places include a point nearby or inside their location to give customers the opportunity to have access to their money for shopping. Unlike cash it has also a secured feature in case

of misplaced or stolen. If the person who gets the ATM card doesn't know the pin security code, your money cannot be accessed.

Point of Sale (POS)

A real or virtual location where commercial transactions take place. A customer can buy things and pay for them using POS. The transactions could take place at a cash register in a retail store or through virtual shopping on Booking.com or Ebay.com. Commercial banks set up point-of-sale systems to allow merchants to take payments using local and international VISA, MasterCard, Union Pay, and American Express cards from all over the world. POS terminals have steadily gained a reputation for being at the heart of business operations, particularly for merchants. Unlike the early POS terminals, which were only used to accept card payments, more modern POS terminals have been upgraded to include additional payment methods of contactless payments like mobile wallets. This technological advancement led to e-POS, which accepts a limited number of digital payments without the presence of card swiping (Nambisan, B., 2021).

Internet Banking (IB)

Financial institutions provides service through internet banking which can be accessed via web browsers and mobile apps, Customers can use mobile apps to access banking services from anywhere with an internet connection. The service can be served to both individual customers and corporate businesses based on the customers need and capacity of the company. Customers may be more satisfied with Internet Banking than with a manual banking system, which requires more time and costs (Hasan, 2015). It provides several advantages to banks, including cost reduction, market differentiation, streamlining of work processes, improve consumer banking service, increased sales, increased reach, increased loyalty and opportunity to attract new customers. It is a self-service model which can be offered anytime and anywhere accessing to a broad range of banking products and services.

Mobile Banking (MB)

Mobile banking refers to the use of electronic mobile devices such as cell phones and PDAs to access banking services and facilities. The use of a mobile phone or another

mobile device to conduct financial transactions tied to a customer account is known as mobile banking (m-banking) Saleem & Rashid, (2011). In his study on the association between mobile banking and commercial bank financial performance in Kenya, Kingoo, N. (2011) noted that m-banking refers to the provision and use of banking and financial services via a mobile communications device.

Mobile Banking enables financial transactions to be carried out on mobile devices such as smartphones and tablets. This service is provided by financial institutions, particularly banks. Unlike the internet banking, it makes use of software, commonly referred to as an app that is offered by the financial institution. Mobile banking has revolutionized the way people in underdeveloped countries transfer money, and it is now set to offer more complex banking services that might have a substantial impact on people's lives (Mabwai, F. 2016). Mobile banking allows users to monitor account balances, make electronic bill payments, receive short notifications on their phones telling them of instant transactions in their bank accounts, and make cash transfers between one customer's and another's accounts, depending on the institution.

Mobile Wallet (MW)

Mobile wallets allow users to use the funds in the wallet to make payments for transactions with multiple merchants, as long as there is an existing contract between the merchant and the mobile wallet company. It allows users to withdraw the funds into a bank account and in cash.

Virtual Banking (ITM)

The hybrid experience of utilizing an Automated Teller Machine (ATM) and engaging with a live teller is created via virtual banking conducted through the use of an Interactive Teller Machine (ITM). ITMs, sometimes known as virtual teller machines, are automated machines that handle currency, receive checks, scan identity, and produce receipts. They also give the transaction a human touch by using digital communication capabilities to communicate with a distant, live person within the bank. ITMs provide voice communication (through a speaker or a private handset), video conferencing, and chat, similar to how Skype works on a PC (Portal.BankofAbyssinia.com).

Credit/Debit Cards

With a certain amount of digit card numbers, expiration dates, and magnetic strips, credit and debit cards look remarkably identical. Both can make purchasing in stores or online simple and convenient. Debit cards are used to make purchases by withdrawing monies from a customer's bank account. Credit cards allow customers to borrow money from the card issuer for purchases or cash withdrawals up to a certain limit. Credit cards are issued by financial entities, most commonly banks, and allow cardholders to borrow funds that must be repaid with interest. When it comes to fraud protection, credit cards outperform debit cards (Cussen, P.M. 2021).

2.2.4 Impacts of Digitalization on Bank Profitability and Performance

The world is undergoing a rapid digital transformation, dubbed the fourth industrial revolution by some. Several economies and private businesses have begun the process of digital transformation. Ethiopia is expected to follow Ethiopia's lead. The Ministry of Innovation and Technology has released the National Digital Transformation Strategy, which outlines significant changes aimed at transforming Ethiopia into a digital nation by 2025. Payments are a critical enabler for this change, and since technology allows for faster and more frictionless data (and money) transfers in the modern day, a stable and ethical digital payments ecosystem is required.

A service for digital banking activity has become a hot topic in the financial business in the new millennium (Wadesango, N., &Magaya, B., 2020). Digitalization has been known to affect the performance of commercial Banks, both positively and adversely. In the past decade various scholars from different corners of the world have studied the various effects of digitalization on profitability, operations and service quality of commercial banks. There are also researches made in the African continent, especially in countries like Rwanda, Nigeria, and Kenya where there are relatively better digital banking experiences. These countries have clear digital vision and policy frameworks. Although very few, local researches have been made in order to determine the effects of digitalization on the performance of Ethiopian commercial Banks.

2.2.5 Banking practice in Ethiopia

Modern banking in Ethiopia began in 1905 with the founding of Abyssinian Bank, which was founded on a fifty-year deal with the Anglo-Egyptian National Bank. In 1908, three foreign banks, the Socite Nationaled 'Ethiope pour le Développement de l'Agriculture et du, Banque de l'Indochine, and Compagnie de l'Afrique Orientale, were created (Pankhurst, R.,1963). As Geda (2006) points out these institutions have been chastised for being wholly owned by foreigners. The Ethiopian government purchased Africa's first national bank in 1931, renaming it Bank of Abyssinia after the Abyssinian Bank, which had only been in operation for a few years before being closed owing to the Italian invasion. Several Italian bank branches had been established by the time of the Italian invasion.

During the five years of Italian occupation, banking activity increased (1936-41). Italy's banks were quite active. Barclays Bank was established following Ethiopia's independence from Italy's brief occupation, and it remained in operation in Ethiopia between 1941 and 1943, thanks to Britain's strategic planning throughout World War II (Gedey 1990; in Geda, 2006). In 1943, the Ethiopian government established the Ethiopian State Bank. Before being reformed into the National Bank of Ethiopia (the Central Bank, re-established in 1976) and the Commercial Bank of Ethiopia, the Bank of Ethiopia served as both a commercial and a central bank until 1963. Following this time, a flood of new banks arose, many of which had been in operation prior to the Great Depression.

Following the fall of the imperial government in 1974, the Commercial Bank of Ethiopia (CBE) took over all private commercial banks. Ethiopian financial sector reforms did not allow private sector participation in existing government banks or the entry of foreign banks until 1994 Geda (2006). After 1994, a new chapter in the history of banking was written, allowing local private banks to operate in the country. As a result, Awash international bank s.c, Ethiopia's first indigenous private commercial bank, was founded by 486 initial shareholders with a paid-up capital of Birr 24.2 million. It received its banking license on November 10, 1994, and began operations on February 13, 1995. With a recently joined four private commercial banks, the Current banking industry

comprises one state-owned development bank and 21 commercial including the state owned dominant Commercial Bank of Ethiopia (NBE annual report, 2021) .

According to Keating (2014) the financial sector in Ethiopia is dominated by the state owned Commercial bank and also the sector is on its infancy stage. CBE dominate the sector and it accounts with a total of 70 percent of the industry's asset holdings. This monopoly has a negative influence on the country's economic growth and financial intermediation. In comparison, banking businesses in regional and international peer countries have a substantially higher level of private sector and foreign participation. Literatures revel, compared to most countries, for so many purposes and intent, Ethiopia has refrained from opening up its banking industry. This generally resulted in less development than its regional peers (Keatinge, 2014).

The banking sector dominates Ethiopia's financial sector. The strength of any economy is determined by the efficiency and competitiveness of its financial system. Ethiopian banks, like those in other developing countries, play a critical part in the country's economic growth and development. Banks are a necessary component of every financial system. They serve a crucial role in moving surplus sector savings to deficit sectors. Since the financial liberalization in Ethiopia, the numbers of financial institutions come to operation increase rapidly. However, Cash remains the most widely used medium of exchange (Garedachew, W. 2010).

Digital Banking practice in Ethiopia

Ethiopia's main state-owned bank, Commercial Bank of Ethiopia, began e-banking in 2001. With eight ATMs in Addis Ababa, CBE was a pioneer in establishing ATM service for local users. Furthermore, CBE had been a Visa member since November 14, 2005. However, due to lack of adequate infrastructure, the membership was not successful.

Dashen bank began offering ATM and POS services to Visa cardholders in 2004. In 2008, the bank received a membership license from MasterCard and began taking MasterCard in addition to Visa cards. Customers might withdraw a maximum of 3,000 birr in a single transaction. The bank has worked hard to maintain its position as the market leader in electronic payment systems (Garedachew, W. 2010). Dashen Bank is the

first bank in Ethiopia to provide a full-fledged payment card service as a primary plus member of AMEX, VISA, MasterCard, and Union Pay, as well as the first African bank to sign such an arrangement. Dashen Bank has placed 389 ATMs and 1,283 plus Point-of-Sale (POS) terminals across the country. Through its Omni channel banking services, the bank provides digital payment capabilities as well as access to aggregated digital products and services. One of a kind in Ethiopia is the launch of an international commerce gateway that accepts international cards such as Amex, Visa, and MasterCard (Dashen bank annual report, 2021).

On December 30, 2008, Wegagen Bank inked an agreement with Technology Associates (TA), a Kenyan information technology (IT) business, for the construction of an ATM network and a payment system solution. Currently the bank offers different digital banking products to its customers (Wegagen bank).

Zemen Bank launched a full-fledged version of its internet banking services in 2010, allowing users to conduct online bank transfers to other banks, examine balances, and track loan progress, among other things. Zemen bank's services are still available through a variety of banking channels, all of which are adapted to the needs and tastes of its customers and are all incorporated into Omni channel banking (Zemenbank, 2021).

On July 5, 2012, three private commercial banks agreed to launch Premium Switch Solutions S.C. (PSS) with a capital of 165 million birr. Awash International Bank, Nib International Bank, and United Bank have created a consortium to provide electronic banking services. Berhan Bank joins the consortium on June 27, 2013. The arrangement is Ethiopia's first significant cooperation between competing banks, setting a precedent for other banks to follow in their footsteps, as no single bank in Ethiopia can afford to provide vast regional coverage (Wondimu, M. 2013).

Electronic banking facilities provided by most Ethiopian Banks are very basic. Next to other private commercial banks, Bank of Abyssinia (BOA) introduced its electronic banking service in 2014 with the support of core banking system which was implemented two years ahead. The Bank has started out card banking (ATM and POS) with 50ATM machines installed in various location and Mobile Banking. On the same year, The Bank

has been also in the process of introducing other types of electronic banking channels such as mobile and internet banking and Agent banking which enable to increase its effort and proximity to the existing and prospective customers. As a result of the enhancement work which has been made on mobile and internet banking, more secured, reliable and faster online banking products including newly virtual and e-commerce service has roll out to retail and corporate customers (BOA Annual report, 2020).

Ethiopia's banking sector appears to be underdeveloped, demanding rapid capacity building and financial system modernization using cutting-edge technologies available elsewhere in the world. Ethiopia's current banking system falls short of offering effective and dependable services, given the expanding number of import-export enterprises, greater international trade, and increased international ties. As a result, all commercial banks in Ethiopia should understand the necessity to implement an electronic banking system in order to meet the needs and requirements of their consumers. (Garedachew,W. 2010). Although the adoption of digital mechanisms for financial transactions is still low in Ethiopia, it has a substantial room to expand. The number of debit card holder‟s increase from time to time. However, only 12% of Ethiopians made or received digital payments during the last year, compared to the 4% of population that hold a debit card. Credit cards are not issued in Ethiopia and are used only by foreigners and diaspora (0.3% of population). However, while peer countries such as Kenya and Rwanda evidenced an increasing usage of mobile money as a solution for financial inclusion (73% and 31% of population), in Ethiopia it is less than 1% due to regulation restrictions (Digital Ethiopia 2025).

2.2.6 Determinants of Financial Performance

Banks' Financial performance is a measure of a company's ability to earn revenue from its primary way of operation. This term can also be used to describe a broad indicator of a company's overall financial health over time, and it can be used to compare similar companies in the same industry or to compare industries or sectors in aggregate (Sime et al., 2020).

The ultimate goal of a given firm performance is measured through profit. Banks' profitability determinants are normally consisting of factors that are within the control of commercial banks. These factors which affect the revenue and the cost of the banks are classified into two categories namely the financial statement variables and non-financial variables. Bank‟s balance sheet and income statement have a direct relationship with the financial statement variables. Whereas, the non-financial statement variables include factors like management quality, efficiency, and productivity, the number of branches of a particular bank location, size of the bank, and technology. Banks have deployed different ratios to measure profit of which Return on the asset, return of equity, and net interest margin are the major ones (Devinaga Rasiah, 2010).

According to Aburime (2008), there are two common ways of classifying bank performance determinant which are classified as internal (bank specific) and external (macro-economic) factors. Internal factors are specific to individual banks which can affect the performance of the bank. Internal (bank specific) and external (macro-economic) factors are the two most popular approaches of identifying bank performance determinants. Internal factors are unique to each bank and might have an impact on the bank's success. Operating environment and technology, human capital, management efficiency, business risk, loan performance, earning quality, liquidity, net-worth, asset quality, asset size, and capital adequacy are some of the most common internal determinants of a bank's performance. Bank concentration and regulation, inflation rate, actual economic activities (GDP), and tax rate are examples of external influences.

2.2.7 Digital Banking and Financial Performance

Prior to the emergence of information technology, the cash-based transaction was the only channel of conducting banking transactions which were characterized with risk, inefficiency and inconvenience to both the banks and the customers (Boateng, 2020). With the advancement of technology over the past two decades, the banking sector has embraced and offered a variety of electronic banking channels with the goal of increasing efficiency, convenience, and financial inclusion.

In prvious decades, a bank's large branch network might have been leveraged to gain a competitive advantage over rival banks. In today's banking world, however, this is not the best method for banks to service their customers and urge them to stay with them. Instead, by using the e-banking platform to consistently generate novel products and services at a cheaper cost, future consumers will be attracted to the bank and existing customers' loyalty will be increased, causing them to stay with the bank (OBENG-OSEI, 2019). Banks that want to gain a competitive advantage use the internet and other communication technologies like mobile banking to maintain a smooth flow of information with their consumers (Shah, 2009).

Increases in new customer acquisition, customer retention, resource mobilization, and cross selling opportunities have all been identified as possible drivers of the revenue rise brought about by e-banking channels. There is still a debate about whether the increase in revenue is sufficient to provide banks with a satisfactory return on investment (Shah, 2009). One of the main economic arguments for e-banking has been the lowering of overhead costs, as it eliminates the need for more bank branches and their accompanying operational costs. According to Young (2007), the implementation of e-banking entails a significant financial expenditure. System integration, internet security, and labor costs all have a tendency to undermine profits.

Despite the high investment of ICT, digital banking has a huge impact on Nigerian‟s deposit banks profitability. Electronic banking plays a major role in the financial performance of commercial banks in Kenya. A study by Simiyu (2018) noted that electronic banking has been found to increase profitability, improve bank management quality, raise bank assets, and stimulate growth and expansion. Due to its time savings, convenient access to cash, and ease of use of the goods, ATMs have been considered to be a more appealing digital banking channel than internet banking. In addition, customers believe that ATM is safer and much secure than internet banking (Mawutor, J.K.M., 2014).

Due to its 24/7 convenience service to clients, the introduction of mobile banking into the digital banking channel has resulted in a significant growth in banking users. Commercial banks' profitability has improved as a result of a growth in the number of users and

transactions on mobile banking. The greater the number of mobile banking transactions, the higher the capital adequacy ratio, the larger the market share, and the greater the number of mobile banking users, the better financial performance (Mabwai's, 2016). Banks' profitability improved as a result of their use of e-banking, resulting in increased income. The driving reason behind digital banking is operating cost minimization and operating profit maximization (Simpson, 2002).

2.2.8 Measures of Commercial Bank's Performance

According to the study conducted by Ntuite (2015), profitability is the most common measure of bank performance. Even though a commercial bank may have social and economic goals, profit is its ultimate goal. There are varieties of ratios that can be used to measure the profitability of commercial banks. Among these ratios, Return on Asset (ROA), Return on Equity (ROE), and Net Interest Margin (NIM) are the major ones.

A. Return on Asset (ROA)

Corporate Finance Institute defines Return on Asset (ROA) as one type of return-on investment metric that measures the profitability of a company in relation to its total assets. It indicates how well a company is performing by comparing the capital it has invested and the profit it has generated from the capital. A higher return indicates a productive and efficient management in utilizing economic resources. ROA can be calculated using the following formula:

Return on Asset (ROA) = (Net Income / Total Assets) * 100

B. Return on Equity (ROE)

According to Ahsan (2012), Return on Equity (ROE) is defined as the amount of net income returned as a percentage of shareholder's equity. Rappaport (1996), as cited in the study states that Return on Equity (ROE) is the most widely used measures of corporate financial performance. It is popular among investors since it links the income statement to the balance sheet. However, ROE can be a misleading measure of financial performance because earnings can be manipulated by changing the accounting policy (Ahsan, 2012). ROE can be calculated as below:

Return on Equity (ROE) = (Net Income / Total Equity) * 100

2.3. Empirical studies related with E-banking

Some related studies are conducted by different researchers in different parts of the world. Gardachew (2010) conducted research on the opportunities and challenges of E-banking in Ethiopia. The aim of his study was focused on analyzing the status of electronic banking in Ethiopia and investigates the main challenges and opportunities of implementing E-banking system. The author conducted a survey on the existing operating style of banks and identifies some challenges of using E-banking system, such as, lack of suitable legal and regulatory frame works for E-commerce and E- payments, political instability in neighboring countries, high rates of illiteracy and absence of financial networks that links different banks. According to Gardachew (2010), Opportunities offered by ICT through e-learning programs and Commitment of the governments on development of ICT infrastructures is considered as drivers of using Ecommerce and E-payment systems. In Kenya, Muiruri & Ngari (2014), conducted a study titled "Effects of Financial Innovations on the Financial Performance of Commercial Banks in Kenya". The study was conducted to determine whether credit cards, mobile banking, internet banking and agency banking affect the financial performance of banks in Kenya. The researchers utilized a descriptive research design and sampled 16 out of 44 commercial banks in the country. The researchers found that some banks in Kenya had adopted innovations such as credit cards, mobile, internet and agency banking. The result of the study indicates that all the innovative features had a great impact on the performance of the banks and increased their profitability. The study is concluded by stating that Kenyan banks use financial innovations to survive the competition in the market.

Another study was conducted in Kenya by Wachira & Ondigo (2016) to determine the effects of technological innovation on the performance of commercial banks in Kenya. The study was a census and employed a descriptive cross-sectional design. The researchers categorized technological innovation into customer independent technology; customer assisted technology & Customer transparent technology and took them as the independent variables, while taking ROA as the dependent variable. The results of the study revealed that the combined effect of the independent variables on profitability was

positive. The researchers concluded their study by stating that technological innovation is a key driver of bank's performance.

According to Boateng and Nagarju (2020), Ghana's banking system has adopted and introduced numerous channels of electronic banking during the last two decades with the primary goal of improving efficiency, convenience, and financial inclusion. Boateng and Nagarju studied on the impact of digital banking on the profitability Ghanaian deposit. Secondary source date from annual report of the central bank of Ghana has employed. Data is analyzed using the Partial Least Square (PLS) regression model. Result from the PLS revealed that out of the six independent variables only two variables are significantly impact on the profitability of the bank. Positive relation with the profitability of the bank has been seen with regard to the independent variables of cheque code line clearing; Ghana automated clearing house, Ghana interbank settlement and GH-Link. And unexpected result has been exhibited on mobile money and E-zwich negatively related with the dependent variable of profitability of the banks. This is due to double charge policy on mobile money which resulted in customer dissatisfaction and shortage of Ezwich machine.

A study by Taiwo, J.N., Agwu, E. (2017) on the role of e-banking on organizational performance tried to determine the impact of operational efficiency of banks: bank revenue and base, customer loyalty. The study used Primary data obtained by administering questionnaires to the staff of four purposively selected commercial banks in Nigeria. The data was analyzed using Statistical Package for Social Sciences (SPSS). According to the research, banks' operational efficiency improves as a result of e-banking adoption, as seen by increased revenue and capital bases and increased client loyalty.

Referring on the above researches which were made in the context of the African commercial banking industries where a cashless policy has been declared and practiced since 2012. In addition, most of the banks have introduced various channels of electronic banking since the past two decades ago. On the other hand, the current researcher is proposing to make a similar study on the Ethiopian society where the National Digital Payment Strategy is only a new release, in 2021, and the practice and adoption of digital financial services by the public is at its infant stages. The current Ethiopian commercial

banks are not yet fully digitalized; so that digital banking is more or less a choice to the customer.

Girma (2016) used secondary data to conduct a research ICT impact on the performance of the Ethiopian banking industry from 2010 to 2014. The data is analyzed in a panel environment. The researchers used a purposive selection strategy to choose six samples from Ethiopia's 18 commercial banks. The study used ROA as dependent variable and six independent variables (ICT investment, ATM, POS, INFLATION, BRANCH and GDP) and deployed co-integration regression analysis to affirm the result and impact of ROA analyzed using ordinary least square technique. According to the regression results, ICT, ATMs, and POS have no statistically significant impact on commercial banks‟ return on assets. Based on the study's findings and conclusions, the researcher advised Ethiopian commercial banks to enhance their return on assets by improving their ICT.

Dawit (2017) made a study to identify the relationship between IT investment and profitability of commercial banks in Ethiopia. In order to achieve this, Dawit used a multivariate regression model using ROA as a dependent variable for measuring financial performance whereas he used six independent explanatory variables, three of which are IT related (Hardware, Software and IT Service). The researcher has concluded that there is a negative significant relation between IT investment and financial performance.

Kassa (2017) found that E-banking services have a favorable impact on the profitability of CBE by minimizing transaction processing mistakes, saving time, lowering the risk of losing cashes, and enhancing the bank's operational reliability. While the study finds that attracting new clients to the bank, reducing the firm's human resource requirements, and improving customer loyalty to the bank are all of lesser value. Electronic banking and its five components (i.e., automated teller machines, bank cards, online banking, telephone banking, and point of sale) have a favorable link with bank profitability, according to the empirical investigation.

According to studies made on digital banking, such as Solomon, W. (2016) and Elias, G. (2019), have been undertaken on the role of e-banking on the financial performance of commercial bank Ethiopia. Other Ethiopian research on the other hand, focused on the

acceptance of e-banking, as well as its challenges and prospects in the Ethiopia banking system. Ayana, G. (2010) Barriers and Drivers of e-banking adoption in Ethiopia; Gardachew, W. (2010) on the challenges and opportunities of electronic banking practices in Ethiopia, and Million, (2013) on impact of electronic banking on custom satisfaction. This shows that more research has to be done on the impact of digital banking on commercial banks profitability in Ethiopia.

Digitalization is a ubiquitous influence nowadays, impacting many industries, including the banking sector. Banks are facing tremendous competitive pressure and the need for the development of digital opportunities is urgent to ensure future success. As a result, the question is not if or whether digitization affects the Bank's profitability, but rather how. The way business is done is being challenged, and it must be modified to the changing market conditions. The topic of digitalization has been discussed for more than 20 years, but not until recently banks discovered this topic as present and of strategic relevance. Digitalization in banking along with other factors, such as changing customer experience on digitalization, operational excellence, accessibility option and increasing regulatory frameworks, is a relevant influencing factor for banks.

2.4 Summary and Research Gap

In summary, several studies have been carried out by different researchers to determine the effect of digital technologies on financial performance of commercial banks in many countries. The results of these studies are mostly similar. Although some of the variables showed a negative or insignificant impact on the financial performance of the commercial banks in a few studies, they mostly had a positive and significant impact.

In Ethiopia, majority of the researches undertaken in the area of technological innovation focused on the adoption, challenges & prospects, and barriers & benefits of electronic banking as well as customer’s satisfaction with e-banking. This implies that identification of the effect of technological innovation on the financial performance of commercial banks is a very important area of study in Ethiopia. Therefore, this study intended to fill this gap in literature by identifying the effect of digitalization on the Return on Asset (ROA) of selected private commercial banks in Ethiopia.

2.4 Conceptual Framework

Return on Asset (ROA) has been used to measure financial performance of the commercial banks as it is the most common measure of financial performance used in these types of studies. ATM's, internet banking, mobile banking, debit cards and POS terminals has been used as measures of digitalization. The conceptual framework of the relationship between the dependent, independent, and control variables is depicted

below.

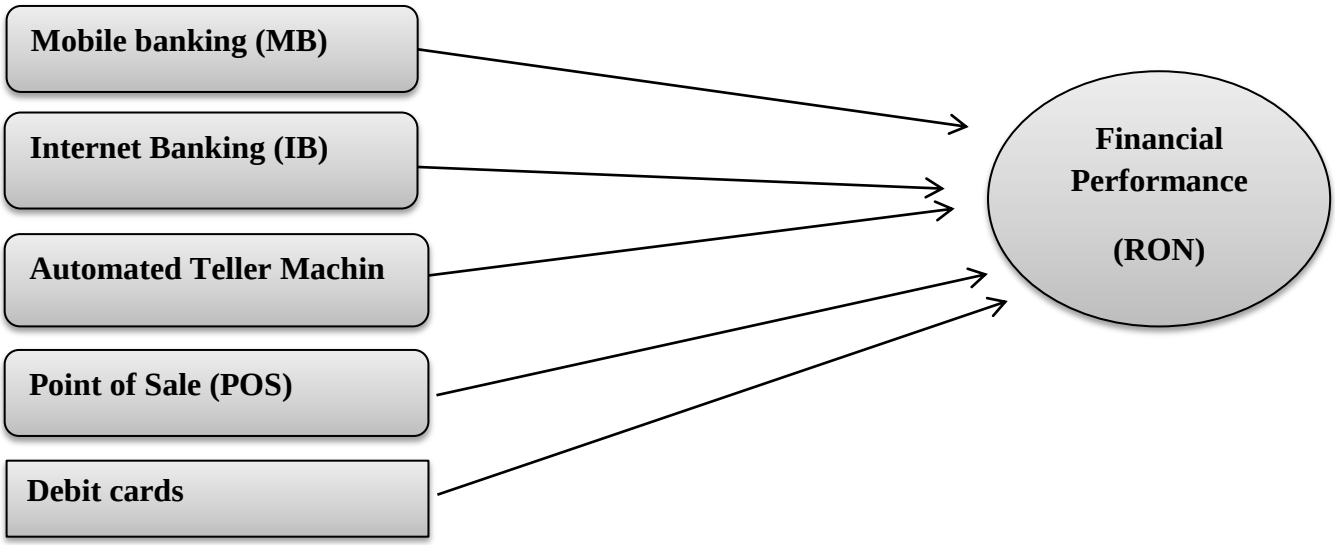

Figure1: Conceptual framework of the study
Sources: own construction from literature

CHAPTER THREE

3. RESEARCH METHODOLOGY

3.1 Introduction

This section deals with the research design and methodology which are going to be applied to carry out this particular research. In research, the methodology section allows the reader to critically evaluate a study's overall validity and reliability. The research contributes new ideas to the existing knowledge. It can be done with the help of study, experiment, observation, analysis, comparison, and reasoning. Most importantly research seeks predictions of events and explanations, relationships, and theories for them (Goundar, 2012). The chapter is structured into five parts; begins with research design, the study population and sampling techniques, data type and data collection method, data analysis, and model specification.

3.1 Research Design and Approach

Descriptive and explanatory research design was used as the main aim of the study is to describe the effect of digitalization on the financial performance of private commercial banks in Ethiopia. The study was conducted using panel data for a period of seven years on ten (10) selected private commercial banks in Ethiopia. The study used quantitative research approach by involving secondary data which was collected from head office and published documents of the banks.

3.3. Target Population

The study's target population was ten selected private commercial banks operating in Ethiopia from (2017-2023) that have adopted digital banking services. According to Lavrakas (2008), a target population defines those units for which the findings of the survey are meant to generalize. For this study, banks that focused on digital banking and sufficient available data are the target population. These banks are: -Dashen Bank, Bank

of Abyssinia, Awash Bank, Nib International Bank, Bunna International Bank, Zemen Bank, and Wegagen Bank , Abay bank, and Anbesa international .

3.4. Sample Size and sampling Techniques

A purposive sampling has been employed which is a non-probability sampling technique. This is because the banks are selected based on personal judgment instead of random selection. The criteria set to select banks to be studied were focus on digital banking technologies and availability of sufficient data.

3.5. Source and Types of Data

The study used quantitative research approach by involving secondary data which was collected from head office and published and unpublished documents of the banks. In addition, financial statements and Annual reports of the banks were main sources of secondary data.

3.6. Methods of Data Analysis

3.6.1. Model specification

To achieve the objective of these study two types of data analysis were used namely descriptive and econometric methods. Statistical software STATA version 14 was used in the analysis.

Before processing the responses, data preparation was done on the completed secondary data by editing, coding, entering and cleaning the data. In this stage, the collected data throughout the whole study were presented, described, and interpreted to pull together the conclusion and recommendation of the study. The data was analyzed by using descriptive statistical tools using mean and standard deviation. To test the relationships between various independent variables (internet banking, mobile baking, ATMs, debit cards and POS terminals) and dependent variable (return on asset), statistical technique for hypothesis testing specifically, fixed effect panel regression model analysis was used.

Econometric Model Specification

The main objective of the study was to evaluate the effect digitalization on private commercial banks profitability in Ethiopia by using a fixed effect panel regression model over the period 2017–2023. Panel Regression is a combination of cross section data and time series, where the same unit cross section is measured at different times (Gujarati, D. N. 2005). So in other words, panel data is data from some of the same individuals observed in a certain period of time.

The basic idea of fixed effects model is to start with (1):

$$Y_{it} = \alpha_i + \beta_1 X_{it} + u_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 1$$

Instead of treating α_i as random, we assume that it is a fixed variable with a mean value of α (no subscript i here). And the intercept value for an individual entity can be expressed as:

$$\alpha_i = \alpha + \varepsilon_{\mathrm{it}}, \mathrm{i} = 1 \dots\dots \mathrm{n} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 2$$

Where ε_{i} is a random error term with a mean value of zero and variance of δ_{ε}^2.

What we are essentially saying is that the entities included in our sample are a drawing from a much larger universe of such population and that they have a common mean value for the intercept (=α) and the individual differences in the intercept values of each entity are reflected in the error term ε_{i}.

Substituting (2) into (1), we get:

$$Y_{it} = \alpha + \beta_1 X_{it} + \varepsilon_{\mathrm{it}} + u_{it} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3$$

$$Y_{it} = \alpha + \beta_1 X_{it} + \mathrm{w}_{\mathrm{it}}, \qquad \text{where: } \mathrm{w}_{\mathrm{it}} = \varepsilon_{\mathrm{it}} + u_{it}$$

In random effects model (REM) or error component model (ECM) it is assumed that the intercept of an individual unit is a random drawing from a much larger population with a constant mean value. The individual intercept is then expressed as a

deviation from this constant mean value. One advantage of ECM over FEM is that it is economical in degrees of freedom, as we do not have to estimate N cross- sectional intercepts. We need only to estimate the mean value of the intercept and its variance. ECM is appropriate in situations where the (random) intercept of each cross sectional unit is uncorrelated with the regressors (zulfikar, rizka, 2018). The following equation describes the growth model adopted in this study:

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \cdots \beta_k X_{kit} + u_{it}$$

Where: A double subscript is used to distinguish entities bank and time periods, that is **i** represents each bank in the panel and **t** indicates the time period. $Y_{it}$is dependent variable used as a proxy for lending decision. In this regression analysis independent variables are internet banking, mobile baking, ATMs, debit cards and POS terminals.

Regression Model:

Yi = β0 + β1NATMs+ β2NMBU + β3NIBU + β4NDCU+ βNPOS + μ

Where;

NATM = Number of Automated teller machine.

NMBU = number of mobile banking users

NIBU = Number of internet banking users

NDCU = Number of debit card users

NPOS = Number of point of scale terminals

The coefficients associated with each independent variable which measures the change in the mean value of Y, per unit change in their respective independent variables.

3.7.3. Operationalization of Study Variables

3.7.3.1. Dependent variable

In order to identify the effect of digitalization on the financial performance of commercial banks, Return on Asset (ROA), which is the ratio of net income before tax to average total assets, will be used as a measure of financial performance. ROA shows the percentage of how profitable a company's assets are in generating revenue (Wikipedia, n.d).

3.7.3.2. Independent Variables

In this study, internet banking, mobile banking, ATMs, debit cards, and POS terminals are used as measures of digitalization. These variables will be briefly defined below:

a. Internet Banking

Mai et al (2007), as cited by Al-Weshah (2013), refers to internet banking as a deployment over the internet of retail and corporate banking services that involves individual and corporate clients. These services include payments and settlements, bank transfers, corporate, onboarding and household lending.

b. Automated Teller Machines

Duvey et al (2013) defines Automated Teller Machines (ATMs) as a new banking system in which an account holder can access his/her account anytime and anywhere with a debit card given by a bank. ATMs provide customers with the ability to perform different quick service financial transactions such as withdrawals, deposits, transfers, and balance inquiries at any given point in time.

c. Mobile Banking

Mobile banking refers to the provision of banking services through mobile phones or tablets. It is an alternative and evolution of internet banking. Mobile users can conduct banking transactions such as paying bills, transferring money, and checking balances using their mobile phones. To use mobile banking, there is no need for an internet connection, just a mobile connection (Sadiku et al, 2017).

D.POS Terminals

Points of sale (POS) terminals are hardware systems that are used to process card payments at retail locations. The POS terminal reads the magnetic strips of a debit or credit card to check for the availability of sufficient funds to transfer to the merchant. It then makes the transfer (Halton, 2021).

Table 3.1: Operational Definition of Variables, Measurements, Expected Sign and Relationship

	Variables	Notation	Measurements	Expected sign	Expected relation
Dependent variable	Return on asset	Ln_ROA	LN of Net income before tax/Average Total Asset		
Independent variables	Internet banking	NIBU	Number of internet banking user	Positive	Significant
	Mobile banking	NMBU	Number of Mobile banking user	Positive	Significant
	Automated teller Machine	NATMs	Number of Automated teller machine	Positive	Significant
	Point of sale	NPOS	Number of transaction processed through Point of sale machine	Positive	Significant
	Debit cards	NDCU	Number of Debit card users	Positive	Significant

CHAPTER FOUR

4. DATA ANALYSIS AND DISCUSSION

The study examined the effect of digitization on private commercial banks' financial performance in Ethiopia, using return on assets as a proxy for financial performance in Ethiopia. The data was collected from ten private commercial banks that have full-year data and analysed for about seven years (2017-2023). In this section, descriptive statistics will be discussed first and it will be followed by diagnostic test results of classical linear regression model for heteroskedasticity, autocorrelation, multi-collinearity & normality. Finally, the analysis and interpretation of the fixed effect model regression output will be presented. The data were analysed by using the STATA software of package 14. To fulfil different assumptions of the classical linear regression model different diagnostic tests were engaged. The factual data were analysed and presented using tables and graphs. Besides, econometric analyses of the main findings of the study were presented.

4.1. Descriptive statistics of variables

This section deals with the descriptive statistics of dependent and independent variables employed in the study for the sampled private commercial banks in Ethiopia. The dependent variable is Return on assets and the independent variables are internet banking, mobile banking, automated teller machines (ATMs), debit cards, and point of sale (POS) terminals. The total observation for each dependent and independent variable was seventy. The result of the descriptive statistics, which includes the mean, median, maximum, minimum, and standard deviation and their interpretations are presented below.

Table 4.1: Descriptive statistics of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	70	3.319	3.693	.93	33
NATMs	70	223.257	245.675	9	1277
NPOS	70	404.614	522.452	15	2472
NDCU	70	469306.64	599842.96	10800	3010000
NMBU	70	501894.67	836415.95	1750	4135000
NIBU	70	30754.971	52404.857	400	370000

Source: Compiled from Private bank Annual Report (2023)

According to Table 4.1, Descriptive statistics of all variables results indicate that the mean value return on assets of private commercial banks in Ethiopia (ROA) is 3.32%, with minimum and maximum values of 0.93 and 33 respectively. This indicates that private commercial banks in Ethiopia generated 3.32 net incomes before tax for each birr invested in total assets on average during the study period from the year 2017-2023. The average number of automated teller machines (ATMs) of sampled private commercial banks in the study period was 223.2571, with minimum and maximum values of 9 and 1277 respectively for Abay bank and Bank of Abyssinia. In the study periods of the year 2017-2023, the average number of Point of sale machines (NPOS) of sampled private commercial banks in the study period was 404.61, with minimum and maximum values of 15 and 2472 respectively for Anbesa bank and Awash bank. The average number of debit card users of sampled private commercial banks in the study period was 469306.6, with the minimum and maximum values of 10,800 and 3,01,0000 respectively for Buna bank and Awash bank. The average number of mobile banking users of sampled private commercial banks in the study period was 501,894.7, with minimum and maximum values of 1750 and 4,135,000 respectively for Buna bank and Dashen bank. The average numbers of Internet banking users of sampled private commercial banks in the study

period were 30,754.97, with minimum and maximum values of 400 and 370,000 respectively belongs to Buna bank.

4.2. Correlation analysis

The correlation coefficient is a statistical indicator of how strong an association exists between two variables' relative movements. The degree of linear association between two variables is measured by their correlation. A positive correlation means that both variables shift in the same direction, whereas a negative correlation means that when one variable's value increases, the other variable's value decreases. The correlation coefficient is measured on a scale that varies from −1 through 0 to +1. Complete correlation is expressed by either + 1 or -1.

Table 4.2: Correlation Matrix of Dependent and Independent Variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) ROA	1.000					
(2) NATMs	0.031	1.000				
(3) NPOS	0.033	0.660	1.000			
(4) NDCU	-0.027	0.763	0.622	1.000		
(5) NMBU	-0.075	0.645	0.526	0.687	1.000	
(6) NIBU	-0.021	0.134	0.143	0.126	0.181	1.000

Source: Compiled from Private bank Annual Report (2023)

Correlation shows, how the strength or the magnitude and direction of the variables relationship with each other.

From the correlation analysis result in Table 4.2 above, number of automated teller machines (ATMs) is positively related to return on asset. This implies that, when the number of automated teller machines (ATMs) of private commercial banks in the study area increases, return on asset or Net income before tax also increases and vice versa.

From the result of correlation analysis above, the average number of Point of sale machines (NPOS) is positively related to return on asset. This indicates that when the average number of Point of sale machines (NPOS) of private commercial banks in Ethiopia increases return on assets can also be increased and vice versa.

Based on the table above number of debit card users is negatively correlated with the return on asset level of private commercial banks of the study area. Accordingly, as the time number of debit card users increases return on assets or Net income before tax of private commercial banks of Ethiopia will decrease and vice versa. The possible reason for this negative correlation is the week commitment of banks on card activation even though the cards were produced by the expense of banks. Recruiting or registering customers for debit card without proper screening just only to meet card number targets without consideration of distribution and activation.

The number of mobile banking users is negatively correlated with the return on asset of private commercial banks of the study area. Accordingly, as the time number of mobile banking users increases return on assets or Net income before tax of private commercial banks of Ethiopia will decrease and vice versa. Possible reason for this negative correlation is poor telecommunication infrastructure, inconvenience of products and poor marketing strategy.

The correlation analysis result regarding to correlation between the number of Internet banking users and return on asset or Net income before tax reflected that profitability is negatively correlated with the number of Internet banking users. As a result, when the number of internet banking users of banks increases at the same time return on assets or Net income before tax decreases and vice versa. Possible reason for this negative correlation could be poor telecommunication infrastructure, inactive users due to lack of awareness to use, inconvenience of products and the like .

4.3. Tests for the Classical Linear Regression Model (CLRM) Assumptions

Data analysis of any data set gives appropriate results if the data set used for data analysis holds the assumptions applicable to the method adopted. This study used the fixed effect model method for data analysis. Thus before performing data analysis and making conclusions based on the result derived from the data analysis, it is the responsibility of the data analyst to ensure that the assumptions that are applicable for CLRM hold. This section presents major diagnostic tests of CLRM that include tests for Multi-collinearity, Heteroskedasticity ,Normality and Autocorrelation.

4.3.1. Testing for Multi-collenearity Test

Multi-collenearity test

A multi-collinearity test was conducted and the result shows the presence of acceptable collinearity problems between the independent variables as all the VIF values are less than 10. The variance Inflation Factor (VIF) shows how the variance of an estimator is inflated by the presence of multi-collinearity. The larger the value of VIF, the more collinear the variable is. As a rule of thumb, if the VIF of a variable exceeds 10 that variable is said to be highly collinear Gujarati (2004). A multicollinearity problem is expected when a highly strong correlation (>0.8) is observed between the independent variables. The existence of a multi-collinearity problem affects the stability and the statistical significance of the coefficients as well as the statistical significance of the overall model. Based on the test result below all the variance inflated factor (VIF) values are less than 10 and also all the tolerance values are greater than 0.1 therefore, in this model there is no high multi-collinearity problem. Multi-collinearity problem is not a matter of existence rather it is a matter of degree. Overall, the diagnostic test results denote that the empirical results of this study are robust and reliable for prediction.

Table 4.3: Multi-collonearity Test

Variance inflation factor

	VIF	1/VIF
NDCU	2.947	.339
NATMs	2.892	.346
NMBU	2.071	.483
NPOS	1.904	.525
NIBU	1.038	.964
Mean VIF	2.171	.

Source: Compiled from NBE Annual Report (2023)

From the multi-colinearity test table above the average value of variance inflation factor VIF of variables of this study was less than 10 for each variable. The low variance inflation factor (VIF) indicates that there is no problem of multi-collinearity. Therefore, from this test, the researcher was ensuring that there was no multi-colinearity problem among the variables used for this study.

4.3.2. Hetroscedasticity

It is a Chi-squared test. It tests the null hypothesis of heteroscedasticity. If the chi-squared value is significant with a p-value below the appropriate threshold ((p<0.05) then the null hypothesis of heteroscedasticity is rejected and homoscedasticity will be assumed. It has been assumed thus far that the variance of the errors is constant. This is known as the assumption of homoscedasticity. If the errors do not have a constant variance, they are said to be heteroscedastic. Homoscedasticity assumes that the residuals are approximately equal for all predicted dependent variable scores- the variance of errors is constant, if the assumption is met the pattern of the residuals will have about the same spread on either side of a horizontal line drawn through the average residual (Wooldridge, 2006). Otherwise, if the errors do not have a constant variance, it is said that the assumption of homoscedasticity has been violated. This violation is termed as heteroscedasticity. The Breusch-Pagan test was used to check for the presence of heteroscedasticity in the residuals (see Table 4.4).

Table: 4.4. Hetroscedasticity Test

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of ln_ROA
chi2(1) = 0.01
Prob > chi2 = 0.9172

Source: Compiled from Private bank Annual Report (2023)

As observed from the table above the Breusch-pagan test results of the model LD were found to P- value of 0.9172. Therefore, there was evidence for the absense of heteroscedasticity problems and so the hypothesis is not to be rejected. This indicates that there is significant evidence for the absense of heteroscedasticity at 5%. In other words, in the regression models used in this study, it was proved that the test statistics are not significant and the variance of the error term is constant. Then the linear model is also correctly specified.

4.3.3. Normality Test

Diagnostic tests for classical linear regression model assumptions were carried out first before starting a discussion on the regression output to explain the influencing effect of private commercial bank profitability. According to figure below, the first assumption

required in the classical linear regression model that is the normality assumption was checked to conduct single or joint hypothesis tests about the model parameters.

Normality Test

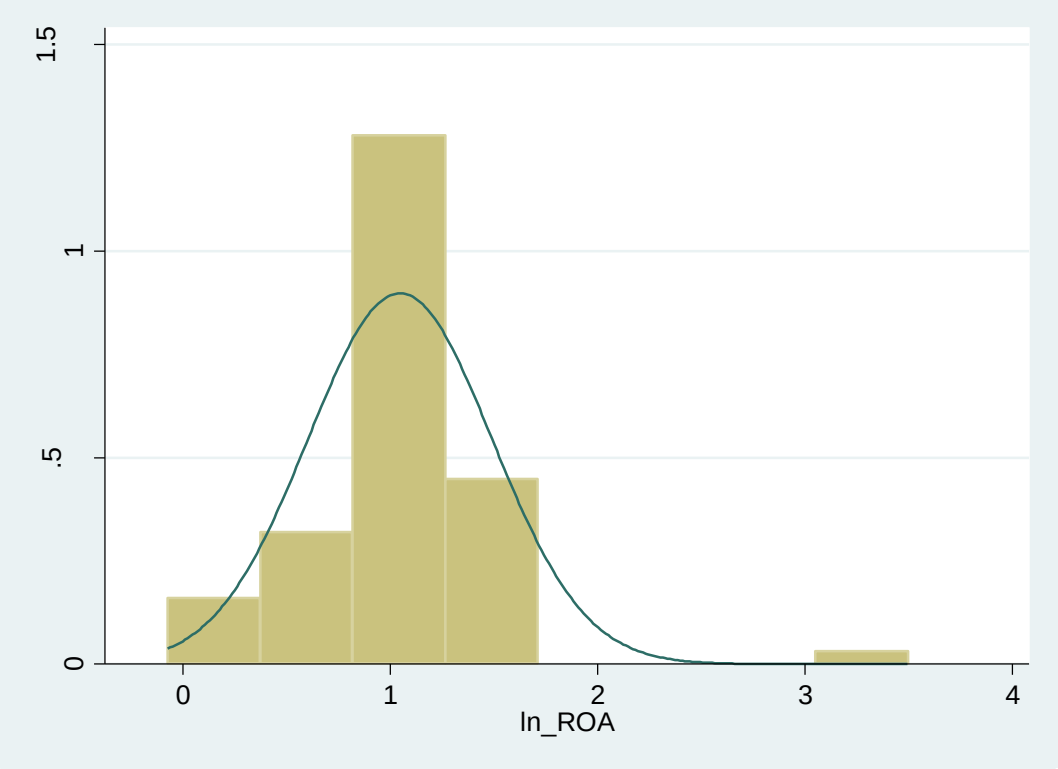

Figure 2: Normality test

4.3.4 Autocorrelation Test

Autocorrelation measures the relationship between a variable's current and past values. It represents the degree of similarity between a given time series and a lagged version of itself over successive time intervals. CLRM assumes that the covariance between the error terms over time is 0 and there is no correlation between them (Smith, 2021). In this study, the wooldridge test for autocorrelation in panel data was used to check for the existence of correlation or pattern between the error terms. As observed from test result below wooldridge test for autocorrelation in panel data found to p-value of 0.2533.Therefore,there was evidence for the absence of serial autocorrelation.

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
F(1, 9) = 1.490

Prob > F = 0.2533

4.4. Model Selection; Random Effect versus Fixed Effect Models

The results of the study presented so far satisfy the assumptions of all classical regression linear models (CRLM), therefore, the regression Model can be safely applied. But, the study uses panel data, so, either fixed effects models (FEM) or random effects models of panel data estimation approaches can be used. Fixed effects models can allow the intercept in the regression model to differentiate cross-sectional but not over time, while all of the slope estimates are fixed both cross-sectional and over time (Brooks, 2008).

The random effects model approach proposes different intercept terms for each entity and again these intercepts are constant over time, with the relationships between the explanatory and explained variables assumed to be the same both cross-sectional and temporally (Brooks, 2008). Hausman specification test was conducted to differentiate whether fixed or random effect is to be used, If the result of the Hausman test is a null hypothesis, hence random effect model is appropriate, whereas as. If the null hypothesis is rejected then we use the Fixed Effects model. The Hausman test hypothesis is:

H0: Random effect model is appropriate

H1: Fixed effect model is appropriate

Table: 4.6. Hausman Specification Test for model selection

Hausman (1978) specification test	
	Coef.
Chi-square test value	35.949
P-value	0.000

Source: Compiled from Private bank Annual Report (2023)

The result as presented in Table 4.6, the P-value of a model is 0.000, which is below 1% significance level. So, the null hypothesis of the random effect model is rejected at a 1 % significant level. This implies that the fixed effect model is more appropriate than the random effect model.

Fixed effect model regression analysis is used to indicate whether independent variables have a significant relationship with the dependent variable or not, and indicate the relative strength of the effect of different independent variables on a dependent variable. The researcher used one dependent variable (ROA) and five independent variables (internet banking, mobile banking, ATMs, debit cards, and POS terminals) to determine whether these independent variables affect the bank's profitability or not.

Regression Analysis, Interpretation and Discussion

Regression analysis is used to indicate whether independent variables have a significant relationship with the dependent variable or not, indicate the relative strength of effect of different independent on a dependent variable and make predictions (Mooi, 2014). In this study, regression was used for one dependent variable (ROA), five independent variables (internet banking, mobile banking, ATMs, debit cards, and POS terminals) and one control variable (bank size) to determine whether these independent and control variables affect the dependent variable or not.

The relationship between the dependent and independent variables is regressed using stata 14. The panel data contains 70 observations for five independent variables on 10 commercial banks. These variables were converted into natural logarithms for proportionality and the dependent variable is presented in percentages. The operational model used is as follows:

$ROA_{it} = \alpha_i + \beta_1 * logNIB_{it} + \beta_2 * logNMB_{it} + \beta_3 * logNATM_{it} + \beta_4 * logNDC_{it} + \beta_5 * logNPOS_{it} + £_{it}$

Table 4.7: Regression Results

ln_ROA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
NATMs	0.0002086	0.0000798	2.62	.028	0.000	0.000	**
NPOS	-0.000363	0.0000741	-4.91	.001	-.001	0.000	***
NDCU	-2.11	0.000	-1.78	.108	0.000	0.000	
NMBU	1.54	0.000	2.01	.075	0.000	0.000	*
NIBU	1.31	0.000	0.47	.65	0.000	0.000	
Constant	1.166	.064	18.22	0.000	1.021	1.311	***

Mean dependent var	1.047	SD dependent var	0.444
R-squared	0.525	Number of obs	70
F-test	99.607	Prob > F	0.000
Akaike crit. (AIC)	42.006	Bayesian crit. (BIC)	53.248

*** *p<.01*, ** *p<.05*, * *p<.1*

Source: Compiled from Private bank Annual Report (2023)

Based on the output above, the relationship between the dependent and independent variables included in the model is represented as follows:

ROAit = 1.166+ 1.31*NIBit +1.54*NMBit + 0.0002*NATMit – 2.11*NDCit - 0.00036*NPOSit + £it

Based on above Table 4.7, the p-values of number of ATMs, the number of POS machines and the number of mobile banking users are 0.0002, 0.00036 and 1.54 respectively; this revealed that these three variables are significant at less than 5% significance level while the p-value of number of debit card users and number of internet banking users are 0.103 and 0.368 respectively; this shows that they are insignificant and this revealed that they could not explain as well as could not affect the return on asset or profitability of Ethiopian private commercial banks.

When we come to coefficients of the independent variables; the number of ATMs, number of POS machines and the number of mobile banking users have a coefficient of

.00021, -.0003 and 1.54 respectively. This revealed that holding other things remains a constant number of ATMs and mobile banking users have a positive relationship with return on asset or bank profitability. This indicates that there was a direct relationship between these independent variables and profitability. Whereas, holding other things remains constant number of POS machines has a negative relationship with return on asset or bank profitability.

Number of ATMs (NATMs): As expected, this variable was found to have a positive and significant influence on bank profitability at a 1 % significance level. The regression result reveals that, keeping other variables constant as the number of ATM users increases by one, the private bank profitability increases by 0.0002 birr. The probable justification is that ATMs play a major role in enhancing the firm's competitive position; since they were first introduced in an attempt to lower bank costs and increase efficiency. Moreover, ATM provides several advantages to banks, including cost reduction, market differentiation, streamlining of work processes, improved consumer banking service, increased sales, increased reach, increased loyalty and opportunity to attract new customers. The result is consistent with Kassa (2017). However, it was different from the finding of Damtew (2016), whose study revealed a negative relationship between the number of ATMs and financial performance.

Number of POS machines (NPOS): Number of POS machine users was found to have a negative and significant influence on bank profitability at a 1 % significance level. The regression result reveals that, as the number of POS machine users increases by one, the private bank profitability decreases by .00036. The possible reason behind this negative correlation between NPOS and ROA would be that banks have a large number of customers for POS machine services, even though few of them are actively transacting on the service due to a lack of awareness about how to use the machine and little support from banks on service usage. As a result, many people may have had doubts about the functionality of the POS machine, increasing the number of unsuccessful POS machine transactions. This negative and significant relationship between the number of POS machine users and ROA could be due to the poor telecom infrastructure in the country, which results in frequent failure of transactions. This result is consistent to the findings of

(Muta, 2010 and Damtew (2016) who stated that there is a weak negative effect of the number of POS machine users on the financial performance of commercial banks which is measured by ROA, in the study conducted at commercial banks of Ethiopia. In contrast, the study conducted by Temam (2018) revealed a positive relationship between the number of POS machines and ROA.

Number of mobile banking users (NMBU): As expected, this variable was found to have a positive and significant influence on bank profitability at a 5 % significance level. The regression result reveals that, as the number of mobile banking users' increases by one, the private bank profitability increases by 1.62. The probable justification is that electronic banking has been found to increase profitability, improve bank management quality, raise bank assets, and stimulate growth and expansion. Mobile banking has revolutionized the way people in underdeveloped countries transfer money, and it is now set to offer more complex banking services that might have a substantial impact on people's lives (Mabwai, F. 2016). Mobile banking allows users to monitor account balances, make electronic bill payments, receive short notifications on their phones telling them of instant transactions in their bank accounts, and make cash transfers between one customer's and another's accounts, depending on the institution. The finding is consistent with the finding of Hanningt on O., (2013 and OGUTU Mary* & FATOKI Olanrewaju Isola, (2019), that there is a positive effect of mobile banking on the financial performance of profitability of commercial banks.

CHAPTER FIVE

5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

This section presents the summary conclusion and recommendation of the most significant findings from the results and discussion.

5.1. Summary

The main objective of this study is to determine the effect of digitization on private commercial bank financial performance in Ethiopia, using return on assets as a proxy for financial performance in Ethiopia. To achieve the stated objectives of the study, the researcher was employed was fully employed secondary data. Secondary data was collected from annual reports of the private bank of Ethiopia. As part of this study, seven years' data of private commercial banks were selected which comprises panel data of 70 observations from 2017 to 2023 and finally analyzed using multiple linear regressions model of fixed effect model.

The population of this study included ten private commercial banks that engage in commercial activities and are registered by the National Bank of Ethiopia. The sample consist ten private commercial banks which were selected based on focus of digital technologies and availability of date by using purposive sampling technique. Moreover, the data was analyzed using descriptive statistical tools using mean and standard deviation as well as statistical techniques for hypothesis testing specifically, fixed effect panel regression model analysis was used.

Descriptive statistics of all variables results indicate that the mean value return on assets of private commercial banks in Ethiopia (ROA) is 3.32%, with minimum and maximum values of 0.93 and 33 respectively. The average number of automated teller machines (ATMs) of sampled private commercial banks in the study period was 223.2571, with minimum and maximum values of 9 and 1277 respectively. In the study periods of the year 2017-2023, the average number of Point of sale machines (NPOS) of sampled private commercial banks in the study period was 404.61, with minimum and maximum values of 15 and 2472 respectively. The average number of debit card users of sampled

private commercial banks in the study period was 469306.6, with the minimum and maximum values of 10800 and 3010000 respectively. The average number of mobile banking users of sampled private commercial banks in the study period was 501894.7, with minimum and maximum values of 1750 and 4135000 respectively. The average numbers of Internet banking users of sampled private commercial banks in the study period were 30754.97, with minimum and maximum values of 400 and 370000 respectively.

The empirical findings of this study disclosed that the number of ATMs, number of POS machines and number of mobile banking users have a significant effect on the profitability of private commercial banks in Ethiopia. While the number of debit card users and number of internet banking users are insignificant and this revealed that they could not explain as well as could not affect the return on asset or profitability of Ethiopian private commercial banks.

5.2. Conclusion

Based on the findings of this study, it can be concluded that digitalization affects the performance of private commercial banks. Descriptive statistics of all variables results indicate that the mean value return on assets, the average number of automated teller machines (ATMs), the average number of Point of sale machines (NPOS), the average number of debit card users, the average number of mobile banking users, the average numbers of Internet banking users of private commercial banks in Ethiopia (ROA) were 3.32%, 223.2571, 404.61,469306.6, 501894.7, 30754.97 of sampled private commercial banks in the study period respectively.

Regression result of number of ATMs, the number of POS machines and the number of mobile banking users revealed that these three variables are significant at less than 5% significance level while the p-value of number of debit card users and number of internet banking users are 0.108 and 0.65 respectively; this shows that they are insignificant and this revealed that they could not explain as well as could not affect the return on asset or profitability of Ethiopian private commercial banks.

The negative and insignificant results in Ethiopia could be due to the poor telecom infrastructure in the country and the lack of awareness among bank customers. Therefore, even if the banks invested heavily in digitalization, as long as the issues of infrastructure and lack of awareness improve, the banks will not be able to see the result of their investments in their return. Another factor that contributed to reduced ROA is the war in the northern part of the country.

5.3. Recommendation

Based on the findings of this study, the following recommendations are hereby made: The result of the study showed, that

- ATMs were found to have a positive and significant effect on ROA. However, this should encourage banks to expand their ATM implementation across the country. They should also make sure that their ATM outlets are maintained properly.
- The number of POS machines was found to have a significant but negative effect on ROA. Although the issue of network infrastructure is a problem in the country, banks should work on creating awareness of the advantages of POS machines over the traditional banking system. They should also work on building trust in using the service. By doing this, they can change the negative effect to a positive one.
- The number of mobile banking users was also found to have a positive and significant effect on ROA.
- The number of internet banking user was found to have positive but insignificant on ROA .Banks should work on increasing their internet banking users and internet banking transactions to increase the significance of internet banking. They can do this by giving short trainings on how internet banking works and explaining its advantages for their non-internet-banking customers
- The number of debt card users was found to have negative and insignificant. Banks should work on proper selection of card user so as to increase active user rate and recover cost of card production.
- Finally, banks should work more on integrating their systems. This would enable customers to transfer money via mobile or online to another bank without having to

open a bank account at the other bank or go to a bank. Although most banks have integrated their systems and ATMs, a system failure occurs sometimes. Therefore, by solving the issue of integration problems, the banks will start to increase their profitability.

- Additionally ,banks should work aggressively on increasing active user rate by creating awareness to their employees and customers .
-

References

Abebe, B. (2019). The Effect of Bank Size on Profitability of Commercial Banks in ethiopia. Addis Ababa.

Ahsan, A. F. (2012). Can Return on equity be used to predict portfolio performance? Economics, Management, and Financial Markets, 7(2), 132-148.

Alfadhli, M. S., & Alali, M. S. (2021). The Effect of Bank Size on Financial Performance: A Case Study on Kuwaiti Banks. Journal of Insurance and Financial Management, 4(3), 11-15.

Al-Weshah, D. G. (2013). The Role of Internet Banking in Continuous Improvement Areas: Quantitative Evidence from Jordanian Banks. International Journal of Business Performance Management, 14(2), 181-196. doi:10.1504/IJBPM.2013.052950

Ameme, B., &Wireko, J. (2016). Impact of technological innovations on customers in the banking industry in developing countries. The Business and Management Review, 7(3), 338-397.

Ashenafi, H. (2019). Effect of ATM Service Quality on Customers Satisfaction in Banking Industry in Ethiopia. Addis Ababa.

Baregheh, A., Rowley, J., & Sambrook, S. (2009). Towards a multidisciplinary definition of innovation. Management Decision, 47(8), 1323-1339. doi:10.1108/00251740910984578

bdc Website. (n.d). 4 ways innovation can help your business. Retrieved from bdc: https://www.bdc.ca/en/articles-tools/business-strategy-planning/innovate/4-waysinnovation-can-help-your-business

Broughel, J., & Thierer, A. (2019). Technological Innovation and Economic Growth: A Brief Report on the Evidence. Arlington, VA: Mercatus Center at George Mason University.

Carleton, S. C. (2019, Dec 9). What is Incremental Innovation? Retrieved from Northeastern University Graduate Programs: https://www.northeastern.edu/graduate/blog/what-isincremental-innovation/

Chaarani, H. E., &Abiad, Z. E. (2018). The Impact of Technological Innovation on Bank Performance. Journal of Internet Banking and Commerce, 23(3), 1-33.

Christensen Institute. (n.d). Jobs to be done. Retrieved from Christensen Institute: https://www.christenseninstitute.org/jobs-to-be-done/

Christensen, C. (n.d). Disruptive Innovation. Retrieved from Clayton Christensen: https://claytonchristensen.com/key-concepts/

Corporate Finance Institute. (n.d). Return on Assets & ROA Formula. Retrieved from CFI: https://corporatefinanceinstitute.com/resources/knowledge/finance/return-on-assets-roaformula

Damtew, T. (2016). Effects of Electronic Banking on the Financial Performance of Commercial Banks in Ethiopia. Addis Ababa.

Hannington Odhiambo Ogare (2013) the effect of electronic banking on the financial performance of commercial banks in Kenya

Temam, R. (2018). The effect of financial innovation on financial performance of commercial banks in Ethiopia. Addis Ababa, Ethiopia.

The OECD Jobs Strategy. (n.d.). Technology, Productivity and Job Creation: Best Policy Practices.

Tigre, T. (2018). Factors Affecting Slow Adoption and Low Usage of Mobile Banking in Ethiopia. Addis Ababa.

Tilastokeskus. (n.d). Retrieved frohttps://www.stat.fi/meta/kas/tekn_innovaatio_en.html

Kenton, W. (2021, January 25). Investopedia. Retrieved from https://www.investopedia.com/terms/h/homoskedastic.asp

Kilma, K. (2021). Normality Testing - Skewness and Kurtosis. Retrieved from gooddata.com: https://community.gooddata.com/metrics-and-maql-kb-articles-43/normality-testingskewness-and-kurtosis-241

King, A. (2017). The Theory of Disruptive Innovation: Science or Allegory? Entrepreneur & Innovation Exchange.

Kramer, L. (2019, Jul 7). What Strategies Do Companies Employ to Increase Market Share? Retrieved from Investopedia: https://www.investopedia.com/ask/answers/031815/whatstrategies-do-companies-employ-increase-market-share.asp

Kylliäinen, J. (2019, October 04). Types of Innovation – The Ultimate Guide with Definitions and Examples. Retrieved from viima: https://www.viima.com/blog/types-ofinnovation#technological-innovation

Laeven, L., Ratnovski, L., & Tong, H. (2014). Bank Size, Capital Requirements, and Systemic Risk: Some International Evidence. Retrieved from https://www.ecb.europa.eu/: https://www.ecb.europa.eu/events/pdf/conferences/140902/bank_size_and_systemic_risk. pdf?3a7a70d742f3995e51e4483b9fe4adbb#:~:text=Bank%20size%20is%20measured%2 0as,to%20total%20risk%2D%20weighted%20assets.

Landry, L. (2020, Oct 1). 3 Types of Innovation You Should Know. Retrieved from harvard Business School Online: https://online.hbs.edu/blog/post/3-types-of-innovation-youshould-know

Landry, L. (2020, March 2). Business Model Innovation: What It Is And Why It's Important. Retrieved from Northeastern University Graduate Programs: https://www.northeastern.edu/graduate/blog/implementing-business-model-innovation/

Lavrakas, P. J. (2008). encyclopedia of survey research methods. Retrieved from sage research methods: https://methods.sagepub.com/reference/encyclopedia-of-survey-researchmethods/n571.xml

Mai, A. N., Vu, H. V., Bui, B. X., & Tran, T. Q. (2019). The Lasting Effects of Innovation on Firm Profitability: Panel Evidence from a Transitional Economy. Economic ResearchEkonomska Istraživanja, 32(1), 3417–3436.

Marshall, A. C. (2013, Apr 11). There's A Critical Difference Between Creativity And Innovation. Retrieved from Insider: https://www.businessinsider.com/difference-between-creativityand-innovation-2013-4?r=US&IR=T

Maverick, J. (2021, May). Key Financial Ratios to Analyze Retail Banks. Retrieved from Investopedia: https://www.investopedia.com/articles/active-trading/082615/key-financialratios-analyze-retail-banks.asp

Sadiku, M. N., Tembely, M., Musa, S. M., & Momoh, O. D. (2017). Mobile Banking. International Journals of Advanced Research in Computer Science and Software Engineering, 7(6), 7576. doi:10.23956/ijarcsse/V7I6/01615

Settearagachew, H. (2017). Assessing the Automated Teller Machine (ATM) service quality of Commercial Bank of Ethiopia (CBE) in Addis Ababa. Addis Ababa.

Sledzik, K. (2013). Schumpeter's View on Innovation and Entrepreneurship. SSRN Electronic Journal, 4(2), 89 - 95. doi:10.2139/ssrn.2257783

Smith, T. (2021, April 29). Investopedia. Retrieved from https://www.investopedia.com/terms/a/autocorrelation.asp

Strauss, L. (2018, Jul 18). Research & Thought Leadership. Retrieved from Digital Asset Ventures: https://www.da.ventures/post/the-3-types-of-innovation-that-should-guideyour-investment-strategy

Suman, S. (n.d). Criticisms of Schumpeter's Theory of Economic Development. Retrieved from economicsdiscussion: https://www.economicsdiscussion.net/schumpeterstheory/criticism/criticisms-of-schumpeters-theory-of-economic-development/13005

Appendix I: Data

Time	Bank	NATMs	NPOS	NDCU	NMBU	NIBU	BANK SIZE(in Billion)	ROA
2017	ABAY BANK	9	20	11000	23500	1800	8.62	2.88729128
2018	ABAY BANK	29	33	26000	78000	2385	14.3	3.39959432
2019	ABAY BANK	65	66	100,133	94,595	3,136	12.32	4.521382232
2020	ABAY BANK	69	76	167,674	164,177	3964	20.2	3.167689566
2021	ABAY BANK	85	91	273,569	303021	5380	29.99	3.843461449
2022	ABAY BANK	161	112	430,705	648,290	10760	40.69	3.196952943
2023	ABAY BANK	211	197	633,000	766000	23400	49	3.16
2017	ANBESA BANK	23	15	33000	39500	7000	11	1.76
2018	ANBESA BANK	27	30	53000	47000	8700	17	2.1
2019	ANBESA BANK	50	36	87000	67000	11300	20.4	1.97
2020	ANBESA BANK	69	40	108000	122000	16000	31.8	2.45
2021	ANBESA BANK	68	59	178,000	253,227	25000	32.2	1.28
2022	ANBESA BANK	69	60	218000	319000	30300	33.2	0.93
2023	ANBESA BANK	89	93	336000	503000	39500	45	1.7
2017	Awash bank	256	388	265000	53000	8700	42	33
2018	Awash bank	265	486	3010000	98500	11200	55.3	3.5
2019	Awash bank	273	616	399000	175000	16400	74.6	4.45
2020	Awash bank	468	581	598000	201000	22000	89.3	4
2021	Awash bank	565	1406	725000	256000	3750	128.7	3.7
2022	Awash bank	565	2,355	926000	410,000	54,000	183.4	4
2023	Awash bank	783	2,472	1,235,000	577,000	90,000	224	4
2017	Bank of abyssinia	114	200	132,103	107,711	10700	25.33	2.11

2018	Bank of abyssinia	118	278	243,215	213,973	15600	31.98	2.4
2019	Bank of abyssinia	173	363	365,390	336,659	20200	39.29	2.59
2020	Bank of abyssinia	233	281	910,567	708,945	23330	56.89	1.89
2021	Bank of abyssinia	969	300	987,984	910,567	27300	104.05	1.97
2022	Bank of abyssinia	969	300	1,250,000	2,260,000	31000	149.45	3.11
2023	Bank of abyssinia	1,277	1,195	2,940,000	2,760,000	64000	189.5	2.75
2017	BERAHAN BANK	18	53	58000	22883	3100	10.5	3.9
2018	BERAHAN BANK	27	85	80600	79700	8500	14	2.67
2019	BERAHAN BANK	40	110	108,771	108,680	15200	18.5	3.5
2020	BERAHAN BANK	53	162	115000	145000	18600	21.3	2.6
2021	BERAHAN BANK	78	206	189000	202000	20000	26.9	1.255618708
2022	BERAHAN BANK	103	267	205000	275000	25400	33.11	1.763193709
2023	BERAHAN BANK	121	301	298000	475000	37000	45	1.34
2017	BUNA BANK	30	15	10800	1750	400	9.84	2.98750127
2018	BUNA BANK	45	21	14879	2640	1240	13.11	3.279318025
2019	BUNA BANK	49	34	37,665	38650	19650	14.55	4.311831666
2020	BUNA BANK	47	39	70,579	50,187	25,600	13.11	3.122820196
2021	BUNA BANK	47	47	123,847	216,105	108,100	25.95	3.609955309
2022	BUNA BANK	147	150	200,197	481,910	233000	34.4	3.480632202
2023	BUNA BANK	156	203	355000	675000	370,000	44	3.46
2017	COOP BANK		67	74,826	199	3220	17.8	1.4
2018	COOP BANK	38	98	79,119	256000	7500	30	2.2

2019	COOP BANK	84	120	113000	315000	11600	41.79	1.8
2020	COOP BANK	109	178	171,065	377,856	15900	52.5	2.7
2021	COOP BANK	186	299	279,593	1,360,281	26900	81.32	2.09
2022	COOP BANK	225	385	401,772	3,520,000	37330	114.6	2.5
2023	COOP BANK	365	565	788,000		48700	133	2.76
2017	Dashen bank	205	837	557000	23500	18900	34.6	2.18
2018	Dashen bank	305	910	711,000	75,000	27560	45.42	2.5
2019	Dashen bank	355	1397	872,000	916,000	30100	56.2	2.27
2020	Dashen bank	389	1174	1,094,000	1,983,000	38200	68.3	2.62
2021	Dashen bank	403	1,340	1,293,000	2,411,000	40,000	94.7	2.56
2022	Dashen bank	405	1456	1,553,000	3,744,000	43,500	117.14	3.24
2023	Dashen bank	650	1540	2,065,000	4,135,000	59000	147	3.26
2017	NIB BANK	111	103	115,889	69300	7900	21.1	2.46
2018	NIB BANK	169	211	170,802	74000	11000	26.6	2.5
2019	NIB BANK	170	314	196,540	83,000	15000	33.7	2.75
2020	NIB BANK	170	385	320,983	110,000	19500	42	3
2021	NIB BANK	170	394	505,059	185000	26000	54.2	3
2022	NIB BANK	274	354	670,469	230,000	38000	61.5	2.8
2023	NIB BANK	350	400	886000	423000	63000	76	3.1
2017	Wegagen bank	196	282	176000	118000	3100	20.9	2.54
2018	Wegagen bank	200	293	214,000	198,500	5400	27.4	3.8
2019	Wegagen bank	249	283	281,121	267,993	7063	29.8	2.5
2020	Wegagen bank	297	273	373,232	574,463	9150	38.1	2.4
2021	Wegagen bank	296	273	528,010	1,019,828	11,518	39.7	4.5
2022	Wegagen bank	298	429	544,157	1,443,566	11,762	45	1.3
2023	Wegagen bank	465	657	660,000	1655000	36000	53	2.1
2017	ZEMAN BANK	32	40	36,069	3,438.00	5100	9.7	3.38

2018	ZEMAN BANK	41	58	39,500	8,880	7,500	12.4	3.21
2019	ZEMAN BANK	59	83	50,166	9362	9,900	14.6	3.22
2020	ZEMAN BANK	68	108	62,109	10,559	12,700	18.5	3.23
2021	ZEMAN BANK	73	178	73746	14795	28400	25	3.42
2022	ZEMAN BANK	100	319	97935	28,273	31000	35.1	3.61
2023	ZEMAN BANK	115	390	195000	47,000	64000	44	3.76