

**Assessment of Digital Transformation in Ethiopia's Financial Sector: A Case Study of
Selected Bank's in Ethiopia**



Abdin Tekalign Duguma

**A Thesis Submitted to the Department of Technology and Innovation Management, School
of Humanities and Social Science**

**Presented in Partial Fulfillment of the Requirement for the Degree of Master of Science in
Technology and Innovation Management**

**Office of Graduate Studies
Adama Science and Technology University**

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Adama, Ethiopia

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DECLARATION

I hereby declare that this Master Thesis entitled “**Assessment of Digital Transformation in Ethiopia’s Financial Sector: A Case Study of Selected Bank’s in Ethiopia**” is my original work. That is, it has not been submitted for the award of any academic degree, diploma or certificate in any other university. All sources of materials that are used for this thesis have been duly acknowledged through citation.

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RECOMMENDATION

I/we, the advisor(s) of this thesis, hereby certify that I/we have read the revised version of the thesis entitled “**Assessment of Digital Transformation in Ethiopia’s Financial Sector: A Case Study of Selected Banks in Ethiopia**” prepared under my/our guidance by Abdin Tekalign Duguma. Submitted in partial fulfillment of the requirements for master’s of Science in technology and innovation management. Therefore, I/we recommend the submission of the thesis to the department following the applicable procedure.

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APPROVAL PAGE

I/we, the advisors of the thesis entitled “**Assessment of Digital Transformation in Ethiopia’s Financial Sector: A Case Study of Selected Banks in Ethiopia**” and developed by Abdin Tekalign Duguma, hereby certify that the recommendation and suggestions made by the board of examiners are appropriately incorporated into the final version of the thesis.

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APPROVAL OF BOARD OF REVIEWERS

We, the undersigned, members of the Board of examiners of the thesis by Abdin Tekalign Duguma have read and evaluated the thesis entitled “**Assessment of Digital Transformation in Ethiopia’s Financial Sector: A Case Study of Selected Banks in Ethiopia**” and examined the candidate during open defense. This is, therefore, to certify that the thesis for partial fulfillment of the requirement of the degree of Master of Science in technology and innovation management.

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LIST OF ACRONYMS AND ABBREVIATION

AI - Artificial Intelligence

ATM - Automated Teller Machine

BoA - Bank of Abyssinia

CBE - Commercial Bank of Ethiopia

CBO – Cooperative Bank of Oromia

DB - Dashen Bank

DBE - Development Bank of Ethiopia

DFS4Res - Digital Financial Services for Resilience

DLT - Distributed Ledger Technology

DT - Digital Transformation

EFT - Electronic Fund Transfer

EIC - Ethiopian Investment Commission

EU - European Union

FDRE - Federal Democratic Republic of Ethiopia

FinTech - Financial technology

FSB - Financial Stability Board

FCY - Foreign Currency

LCY - Local Currency

IMF - International Monetary Fund

INSA - Information Security Agency

ITU - International Telecommunication Union

IT – Information Technology

LIC - Low-Income Country

NBE - National Bank of Ethiopia

NFIC - National Financial Inclusive Council

NFIS - National Financial Inclusive Strategy

NPSC - National Payment System Council

NPSP - National Payment System Proclamation
NRPSS - National Retail Payment System Strategy
PIN- Personal Identification Number
NIB – Nib International Bank
OACPS - Organization of Africa, Caribbean, and Pacific States
OB – Oromia Bank
P2P - Peer-to-Peer
POS - Point of Sale Terminal
UNCDF - United Nations Capital Development Fund
WB - World Bank
WIPO - World Intellectual Property Organization

ABSTRACT

In today's world, digital transformation has become the most important driver of differences among firms', industries', and countries' performances. It can enhance competitiveness by increasing productivity, agility, customer engagement and satisfaction, and profitability. The purpose of this study is to assess the Digital Transformation in Ethiopia's Financial Sector with focus on Ethiopia's Banks. The study begins with an overview of Ethiopia's current legal and institutional framework and efforts made to promote digital transformation since effective national digital strategies require the existence of a conducive regulatory and institutional environment, be it for the private or public financial sector. Using qualitative research methodology, this research explores and examines the policy, legal, and institutional frameworks of the current digital banking system in Ethiopia. The actual progress in digitalization of the banking sector was examined through interviews with selected banks in Ethiopia. Based on findings, the regulatory analysis underscores the policy and regulation empowerment of the National Bank of Ethiopia, revealing gaps in directives related to fraud handling, transaction limits, usage of terms and conditions for digital products, ATM reconciliation, and charges for digital products and services. In addition, a comprehensive study of ten banks shows all ten banks added digital banking structures to their corporate structures. Additionally, credit cards and virtual banking were introduced in Ethiopia by Awash Bank and Bank of Abyssinia, respectively. Also, Cooperative Bank of Oromia, Bank of Abyssinia, and Dashen Bank adopted mobile digital loan platforms. In line with the findings, factors influencing digital banking adoption are elucidated, encompassing challenges such as power shortages and network failures. The study shows Ethiopia's digital transformation compared to its African counterparts, addressing challenges in cyber security readiness and infrastructure and low mobile money usage.

Key words: *virtual banking, digital banking, technological adoption, Ethiopia.*

CHAPTER ONE

1. Introduction

1.1 Background of the Study

Ethiopia is a low-income country (LIC) that has experienced fast economic expansion despite having a financial sector that is underdeveloped and limited access to financial services (Zwedu, 2014). The Ethiopian financial sector has not been abandoned in this digital revolution. In recent years, the sector has witnessed substantial investments in digital technology, which have brought about notable changes in the delivery of financial services (Geda, 2022).

As Digital Ethiopia 2025 Strategy, the financial sector of Ethiopian has undergone a significant transformation in recent years, with the adoption of digital technologies playing a critical role in this transformation and the government of Ethiopia has recognized the potential of digital technologies in enhancing financial inclusion, increasing access to credit, and promoting economic growth (FDRE, 2021). Additionally, the UN's Capital Development Fund (UNCDF), operating through its Digital Financial Services for Resilience (DFS4Res) Program, which is funded by the European Union (EU) and partnered with the Organization of Africa, Caribbean, and Pacific States (OACPS), is supporting institutional partners in Ethiopia to advance an all-encompassing digital economy by improving the agent network model with technical expertise and financial resources (UN, 2023).

Based on World Bank report 2022, Ethiopia's financial system is dominated by banks. The banking sector is comprised of 18 banks including the two state-owned Commercial Bank of Ethiopia (CBE) and Development Bank of Ethiopia (DBE) (World Bank, 2022). But now, currently 29 commercial banks, one development bank, 18 insurance companies, one re-insurance company, 40 microfinance institutions, six Capital goods Finance/Lease companies, and eight payment instrument issuers/system operators are operating in Ethiopia (NBE, 2022).

According to African report the digital transformation of the Ethiopian financial sector has been reflected in the launch of various digital financial services, including mobile money, mobile banking, and online banking, among others (Dadhi, 2022) and mentioned that Ethiopian banks have been at the forefront of this transformation, by introducing the most digital financial services to enhance customer experience and expand their reach. However, the adoption of digital financial

services by Ethiopian banks has not been without challenges, including infrastructure limitations, regulatory frameworks, and cybersecurity concerns (Asamoah, 2022).

From financial sector, the banking industry in Ethiopia is undergoing rapid growth with the liberalization of the financial sector by the commercial Bank of Ethiopia and positive economic environment (Federal Trade Commission, 2006). And because of this, most banks are adopting with increasingly technologies by bringing more innovative concepts into the banking sector. One of key concept is the introduction of E-banking, which involves 24-hour service provision to their clients. In Ethiopia, the earliest forms of electronic and communications technologies used were mainly office automation devices. Telephones, telex and facsimile were employed to speed up and make more efficient, the process of servicing clients. For decades, they remained the main information and communication technologies used for transacting bank business (Abor, 2004).

Technological innovation coupled with availability of internet services in Ethiopia results in banks in Ethiopia networking their branches and provision of service products. Because of competition almost all banks in Ethiopia are now providing various forms of E-banking services. For instance, a report by The Ethiopian herald (2007) showed that Commercial Bank of Ethiopia and Dashen Bank Limited pioneered this very important electronic novelty, which changed the banking landscape in the country.

The rapidly growing information and communication technology (ICT) is knocking the front door of every organization in the world, where Ethiopian banks would never be exceptional. In the face of rapid expansion of digital payment systems throughout the developed and the developing world, Ethiopian's financial sector cannot remain an exception in expanding the use of the system (Gardachew, 2010). Technological innovations play a crucial role in banking industry by creating value for banks and customers, that it enables customers to perform banking transactions without visiting a brick and mortar banking system. On the other hand, digital banking has enabled banking institutions to compete more effectively in the global environment by extending their products and services beyond the restriction of time and space (Turban, 2008). Most of Ethiopian banking system is still underdeveloped compared to the rest of the world and stated in Ethiopia cash is still the most dominant medium of exchange and electronic payment systems are at a beginning stage. Commercial Bank of Ethiopia (CBE), being the pioneer in introducing ATM based payment system; Dashen Bank, which introducing and expanding digital banking in Ethiopia (Fekadu,

2009) . Bank of Abyssinia (BoA) the first bank in Ethiopia to drive e-commerce acquiring thus enabling businesses accept online payments using credit cards (VisaInc., 2020).

1.2 Statement of the Problem

As the world becomes increasingly digital, many industries and sectors are undergoing digital transformations in order to remain competitive and meet changing customer (George et al, 2014). In Ethiopia, the government has recognized the importance of digital transformation and has made efforts to promote it in various sectors, including finance (Ethiopian Investment Commission, 2020). However, the progress and impact of this transformation in the financial sector is not well understood. Studies have shown that digital transformation can lead to increased efficiency, cost savings, and better customer experience (Peter et al, 2021). However, there are also challenges associated with digital transformation, such as security concerns, resistance to change, and lack of digital skills (Rupeika & Petrovska, 2022). In Ethiopia, there are additional challenges such as limited infrastructure, low levels of digital literacy, and regulatory barriers (Yigezu, 2021). To address the obstacles and bridge the prevailing disparity, the Ethiopian government has introduced a national strategy for financial inclusion, aimed at promoting the adoption of digital currency and other innovative financial products, and thus extending access to a broader segment of the population that is currently excluded from modern financial services (Betgilu et al, 2021).

However, the root cause of inadequate competition, and therefore of low financial inclusion through digital payment services, is institutional deficiencies. The two key institutional deficiencies are the lack of capacity of regulatory and supervisory institutions, and the unwillingness of the central government to enable and promote competition (Getnet et al, 2021)

Compared to countries in East Africa and the Sub-Saharan Ethiopia is facing significant challenges in achieving financial inclusion, with levels currently below average (Dinku, 2021). In addition, factors such as high unemployment, low income, and a preference for informal savings over formal financial institutions are major hindrances to the country's financial inclusion strategy. (Lakew et al, 2020)

The main problem for digital transformation in financial sector is due to some operational & cultural deadlocks, such as: Absence of IT infrastructure experienced IT staff, cost associated with

modern technology, Internal and cultural resistance and absence of digital strategy at organizational level (Gardachew, 2010).

According to Gardachew (2010) Ethiopian banking industry faces numerous challenges to adopt E-banking system and grab the opportunities presented by ICT applications in general. The Key Challenges for E-banking applications are:

- Low level of internet penetration and poorly developed telecommunication infrastructure: - Lack of infrastructure for telecommunications, Internet and online payments impede smooth development and improvements in e-commerce in Ethiopia. Most rural areas of the country, where the majority of small and medium businesses are concentrated, have no Internet facilities and thus are unable to engage in e-commerce activities.
- Lack of suitable legal and regulatory framework for digital payment: -Ethiopian current laws do not accommodate electronic contracts and signatures. Ethiopia has not yet enacted legislation that deals with e-commerce concerns including enforceability of the validity of electronic contracts, digital signatures and intellectual copyright and restrict the use of encryption technologies.
- Political instabilities in neighboring countries: - Political and economic instabilities in Somalia, Southern Sudan, and Eritrea are threatening traits that do not provide a very conducive environment for e-banking in Ethiopia. Political instabilities inevitably disturb smooth operations of business and free flow of goods and services
- High rates of illiteracy: - Low literacy rate is a serious impediment for the adoption of E-Banking in Ethiopia as it hinders the accessibility of banking services. For citizens to fully enjoy the benefits of E-Banking, they should not only know how to read and write but also possess basic ICT literacy.
- High cost of Internet: - The cost of Internet access relative to per capita income is a critical factor. Compared to the developed countries, there are higher costs of entry into the digital based e-commerce market in Ethiopia. These include high start-up investment costs, high costs of computers and telecommunication and licensing requirements. Which makes hard to adopt new technologies from other countries or firms for the sake of technology innovation for financial sectors.

- Absence of financial institutions networks that links different banks (Banks are not yet automated: - Most of the banking-transactions currently taking place use credit and debit cards supplied by Visa and MasterCard. For conducting e-banking, the use of credit or debit cards is mandatory thus requiring the need for specialized systems which are not currently available. Frequent power interruption: - Lack of reliable power supply is a key challenge for smoothly running E-banking in Ethiopia.

In this paper, three issues have been assessed: the first one is, the current procedure, policy and regulation governing financial sector in Ethiopia. The second is, Ethiopia's financial sector in terms of adopting digital technologies as compared to other African countries. Lastly, to compare and contrast different Ethiopia's Banks are performing in regards to their corporate structure for digital transformation

1.3 Objectives of the Study

1.3.1 General Objective

The primary purpose of this research is to assess the statuses of digital transformation in Ethiopia's financial sector based on selected banks in Ethiopia.

1.3.2 Specific Objectives

The research will specifically address the following essential research objectives:

- To review Ethiopian government's regulatory environment and strategies on digital transformation of banks,
- To assess Ethiopia's status in financial sector's digital transformation as compared to other African nations,
- To analyze how Ethiopia's banks are adopting digital payments in regards to their corporate structure towards digital transformation of their services and products

1.4 Research Questions

This study will attempt to answer the following questions in order to fulfill research objectives.

- i). What are the policies and regulations that govern digital transformation in Ethiopia's banking sector?

- ii). What is the status of Ethiopia's financial sector in terms of adopting digital technologies as compared to other African countries?
- iii). How Ethiopia's Banks are adopting digital payments in regards to their corporate structure for digital transformation?

1.5 Significance of the study

The importance of this study occurs in many ways. Firstly, it studies the existing policy and regulation of the country based on the current police and regulation of the government. Because this particular type of study had not been previously conducted on these areas. Therefore, its result is important to create awareness to different part of government to play a big role on digital transformation in financial sector mostly in bank.

Secondly, even if there are few documents about Ethiopia digital transformation for financial sector based on local banks this study will enhance more data that interprets financial sector for extra study. And it also assesses the status of Ethiopia's financial sector regarding to adoption of financial technologies compared to other African country.

1.6 Scope and Delimitation of the Study

The main focus of this study is to assess the assessment of digital transformation on selected bank in Ethiopia. So, the study limited on the data which are obtained from banks in Ethiopia. There are certain constraints of the study, the major limitation is availability of adequate published and documented data about digital transformation which is related to Ethiopia digital transformation in financial sector which would be useful.

1.7 Organization of the paper

The final paper of the study has been structured into five chapters. Chapter one covers introduction and background of the study, statement of the problem, objectives of the study, research questions, significance of the study, scope and limitations of the study. Chapter two covers the literature review, both theoretical and empirical, the third chapter deals with methodologies' including, research design, data source and data collection method and sampling method. Chapter four will gives the interpretation of descriptive analysis. Finally, the last chapter includes the conclusions

from the analysis of the data and suggestions part of the study. gives the interpretation of descriptive analysis.

1.8 Ethical considerations

The researcher maintained scientific objectivity for the study, recognizing the limitations of his competence. Every person involved in the study will entitled to the right of privacy and dignity of treatment, and no personal harm will have caused to subjects in the research. Information obtained will held in strict confidentiality by the researcher. All assistance, collaboration of others and sources from which information drawn is acknowledgeable. The following ethical considerations are the base for this research.

- a) Fairness.
- b) Openness of intent.
- c) Respect or the integrity of the individuals
- d) Informed willingness on the part of the subjects to participate voluntarily in the research activity.

CHAPTER TWO

2. Literature Review

2.1 Theoretical Review

Digital innovation is transforming financial services. Innovations in financial technology such as mobile money, peer-to-peer (P2P) or marketplace lending, rob advice, insurance technology and crypto-assets have emerged around the world (Laborda, 2022). In the past decade, financial technology has already driven greater access to and convenience of financial services for retail users. Meanwhile, artificial intelligence (AI), cloud services, and distributed ledger technology (DLT) are transforming wholesale markets in areas as diverse as financial market trading and regulatory and supervisory technology (Kumari et al, 2022)

The aim of the new digital banking system is to make the customer the main driver of its operations. The development of new applications capable of improving the user's experience is the key tool they use to gain the trust of these new digital customers. Banking should focus on regaining customer loyalty by offering facilities rather than imposing conditions. Therefore, banks that are unable to adapt could eventually be displaced, and small financial institutions would disappear or would have to merge with large banks in order to survive (Barroso & Laborda, 2022).

Since decades, the financial industry has experienced a continuous evolution in service delivery due to digitalization. This evolution is characterized by expanded connectivity and enhanced speed of information processing both at the customer interface and in back-office processes. Recently, there has been a shift in the focus of digitalization from improving the delivery of traditional tasks to introducing fundamentally new business opportunities and models for financial service companies. Digital Finance encompasses a magnitude of new financial products, financial businesses, finance-related software, and novel forms of customer communication and interaction delivered by Financial Technology companies and innovative financial service providers (Gomber et al, 2017). The world of finance, in particular banking sector, has proven to be of outstanding importance in daily lives of people around the globe. Classical banking has been changing significantly through the last century (Zavolokina et al, 2016) Financial Technology has long been applied to the financial and banking sectors until the emergence of financial technology innovation called FinTech. Referring to the evolution of FinTech until now, FinTech influences the Bank's

activities from the past, present, and future. Based on these facts (Mercurius et al, 2021). According to the Financial Stability Board (FSB), Fintech firms are described as “technologically enabled innovation in financial services that could result in new business models, applications, processes or products with an associated material effect on financial markets and institutions and the provision of financial services” (FSB, 2017)

Due to the speed of today's technological advances, the Fourth Industrial Revolution is currently disrupting nearly every industry in every country. The scope and extent of these changes involve the transformation of entire systems of production, management and governance (Xu et al, 2018). Therefore, the Fourth Industrial Revolution brings as a result a massive use of the Internet, social networks, digital devices, etc. The result, regarding the scope of this study, is a greater diversity in the form of new business models in the provision of financial services. The outcome is the emergence of a new set of companies, which are entering the market, taking advantage of this digitization, in order to provide financial products and services (Wang et al, 2021). They emerged as an alternative to traditional banking in response to the gap left by banks during the 2008 financial crisis; experiencing an annual growth of 46.5% since its appearance (Fung et al, 2020). These new players, among other effects, facilitate access to the digital financial world, provide more specialized services focused on client needs, are flexible and agile, and boost innovation and competition throughout the financial industry.

2.2 Concept of Digital Banking

Digital banking is the modern delivery channel for banking services. Banks have used electronic channels for years to communicate and transact business with both domestic and international corporate customers. With the development of the Internet and the World Wide Web (WWW) in the latter half of the 1990s, banks are increasingly using electronic channels for receiving instructions and delivering their products and services to their customers. This form of banking is generally referred to as digital banking, although the range of products and services provided by banks over the electronic channel vary widely in content, capability and sophistication. Digital banking is defined as the automated delivery of new and traditional banking products and services directly to customers through electronic, interactive communication channels. The definition of e-banking varies amongst researches partially because electronic banking refers to several types of services through which bank customers can request information and carry out most retail banking

services via computer, television or mobile phone ((Daniel, 1999); (Sathye, 1999)). According to Singh & Malhotra (2004), E-banking can be defined as the deployment of banking services and products over electronic and communication networks directly to customers (Singh & Malhotra, 2004). These electronic and communication networks include Automated Teller Machines (ATMs), direct dialup connections, private and public networks, the Internet, televisions, mobile devices and telephones.

Among these technologies, the increasing penetration of personal computers, relatively easier access to the internet and particularly the wider diffusion of mobile phones has drawn the attention of most banks to digital banking. Digital banking includes the systems that enable financial institution customers, individuals or businesses, to access accounts, transact business, or obtain information on financial products and services through a public or private network, including the Internet or mobile phone. Customers access e-banking services using an intelligent electronic device, such as a personal computer (PC), personal digital assistant, automated teller machine (ATM), kiosk, or Touch Tone telephone. Such products and services can include deposit-taking, lending, account management, the provision of financial advice, electronic bill payment, and the provision of other electronic payment products and services such as electronic money.

2.2.1 Digital Banking Channels

The channels used in order to avail digital banking services are listed as below: -

I. Internet banking

According to (Booz and Hamilton, 1997), “Internet banking” refers to systems that enable bank customers to access accounts and general information on bank products and services through a personal computer (PC) or another intelligent device. Internet banking products and services can include wholesale products for corporate customers as well as retail and fiduciary products for consumers.

Ultimately, the products and services obtained through Internet banking may mirror products and services offered through other bank delivery channels. Some examples of wholesale products and services include: Cash management, wire transfer, automated clearinghouse transactions, Bill presentment and payment.

II. Mobile Banking

Mobile banking (also known as M-banking or SMS banking) is a term used for performing balance checks, account transactions, payments etc. via a mobile device such as a mobile phone. Mobile banking is most often performed via SMS or the Mobile Internet but can also use special programs called clients downloaded to the mobile device. The standard package of activities that mobile banking covers are: mini-statements and checking of account history; alerts on account activity or passing of set thresholds; monitoring of term deposits; access to loan statements; access to card statements; mutual funds/equity statements; insurance policy management; pension plan management; status on cheque, stop payment on cheque; ordering check books; balance checking in the account; recent transactions; due date of payment (functionality for stop, change and deleting of payments); PIN provision, change of PIN and reminder over the internet; blocking of (lost/stolen) cards; domestic and international fund transfers; micro-payment handling; mobile recharging; commercial payment processing; bill payment processing; peer to peer payments; withdrawal at banking agent and deposit at banking agent (Rahman, 2007)

III. Point of Sale Terminal

An advanced payment system, which enables customers to use an ATM card to pay for goods and services, electronically debiting the cardholders account and crediting the account of the merchant (Rahman, 2007).

IV. An automated teller machine (ATM) is a specialized computer that allows you to complete bank transactions without the need to see a bank representative. Many ATMs are conveniently accessible any time of day or night and can be used for everything from withdrawing or depositing money to checking your account balance to transferring money between accounts (Beers & Brian, 2022).

2.3 Empirical literature review

The financial sector is a critical component of the Ethiopian economy, and its digitalization can play a key role in promoting financial inclusion and economic growth (Kotiso, 2019). A study by kitaw and Wanno in 2022, found that customer trust, perceived usefulness, and perceived ease of use were significant determinants of customer adoption of digital banking services in Ethiopia

(Kitaw et al, 2022). use were significant determinants of customer adoption of digital banking services in Ethiopia (Kitaw et al, 2022).

Several relevant investigations are being undertaken by various researchers in various regions of the world. However, there have been few research in Ethiopia on the technical adoption of digital banking goods and services. Specifically, 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 researcher conducted a survey on the existing operating style of banks and identifies some challenges of using digital 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 E-commerce and E-payment systems. Wondwossen and Tsegai (2005) investigated the problems and prospects of E-payments in Ethiopia; their goal was to investigate E-payment practices in developing nations, Africa, and Ethiopia. The authors used interviews and on-site observation to examine E-payment issues in Ethiopia and discovered that the primary impediments to the barriers to the growth of E-payments include a lack of client faith in the efforts and a lack of available payment methods. Payment rules and regulations, notably those pertaining to E-payment, a scarcity of competent labor and Power outages are common. According to Wondwossen and Tsegai (2005), A suitable legal framework, Structure and security framework may encourage the usage of E-payments, which is in conflict with the finding of the prior study.

Daghfous and Toufaily (2007) performed a study on the success and important elements in the implementation of E-banking by Lebanese banks. The research was done on the elements that might contribute to the success of E-banking adoption and other aspects that can a barrier to its adoption, it focuses on organizational, structural, and strategic issues. variables that might either accelerate or impede the adoption of this electronic method of transportation through an examination of the Lebanese instance, banks' distribution and communication market. The results of their study shows that the organizational variables (bank size, functional divisions, technical

staff, technical infrastructure, perceived risks, decision makers' international experience and mastery of innovation) are variables which exert significant impact on the adoption of E-banking, among the structural characteristics, the result revealed that internal technological environment of the bank is a very important factor in determining the adoption of E-banking, also the result shows that banks which are developing in the international scale are more likely to adopt E-banking innovations. Finally, the result of the study indicated that extent of penetration of E-banking in the growth phase of an emerging market has an important correlation with the improvement of commercial performance.

The other descriptive case study analysis entitled "Factors influencing the adoption of internet banking in Oman, aimed to identify the main potential factors or impediments that are currently inhibiting the incorporation or adoption of Ecommerce applications in the Omani Banking sector. The results of their study show a useful picture about the adoption of E-Commerce applications in the core financial sector domain of Oman. One of the main findings is that security and data confidentiality issues have been a major barrier (Khalfan et al, 2006).

In addition to this, Ethiopia's financial system is in its infancy, with relatively low levels of financial-based technologies (NBE, 2017). Only 12% of Ethiopian adults make or receive digital payments electronically via ATMs, mobile money, or other cashless delivery methods (Tadesse, 2018). From Ethiopia's financial sector the most dominant sector is the governmental financial sector which are Commercial Bank of Ethiopia and has kept the prices of digital payment services high, fees charged for low-value transactions are very high and the cost of digital infrastructure is also high. Unless these institutional binding constraints are removed, digital payment services in Ethiopia, and digital financial services more generally, will hit a very short ceiling that limits their enormous potential to improve digital payments in the country (Getnet et al, 2021) . By the end of the first quarter of 2022/23, the number of banks in Ethiopia reached 30, of which 28 were private and 2 were state-owned (the Commercial Bank of Ethiopia (CBE) and the Development Bank of Ethiopia). Additionally, 43 microfinance institutions (MFIs) are operating in Ethiopia (NBE, 2023). The first National Financial Inclusion Strategy was released in 2017, and the National Council for Financial Inclusion was constituted. The strategy intends to provide universal access to and use of a variety of cheap and high-quality financial goods and services by 2025, an ambitious goal considering present trends. Both the Homegrown Economic Reform Agenda and the Ten-

Year National Development Plan (2021-2030), both approved in 2019, perceive digital transformation as a critical driver of digital financial sector progress. Even more, the country's digital transformation strategy was approved in 2020 for the first time. This plan identifies infrastructure (connectivity and electricity), enabling systems (digital ID, digital payment, and cybersecurity), and targets for digital transformation.

The level of transferring digital-based products and services in Ethiopia is very low for many reasons, including the gap in current policies and regulations that govern digital payment channels in Ethiopia's banking, the lack of ICT infrastructure, the low usage of electronic-based payments, and the low adoption rate of digital-based technologies in the country. And the lack of those reasons is the motive for this paper to assess the status of digital transformation in Ethiopia's financial sector based on selected banks in Ethiopia. In particular, the study focuses on current policies and regulations for digital payment channels and digital products and services being used in selected banks in Ethiopia. In line with this, the study also assesses the status of Ethiopia's digital transformation by comparing it with other African countries based on cybersecurity issues and the usage of mobile money payments. For this purpose, in the study of Hanna in 2018, the digital transformation ecosystem was used to develop the conceptual framework for this study.

2.4 Conceptual framework

A conceptual framework is a structure that helps to organize the ideas and concepts that underlie a research study. It sets out the key concepts, theories, and hypotheses that will guide the research process and provide a framework for the analysis and interpretation of the data (Adom, 2018).

The existence and maturity of digital payment legal frameworks within a country influence the diffusion of online transactions including E-banking as demonstrated in various studies (Tan & Wu, 2002). National ICT infrastructure is a major factor that supports the adoption of E-banking as the case for other E-commerce initiatives. Without an adequate development level and quality of a nation's ICT infrastructure, digital payment adoption and use cannot do well (Efendioglu and Yip, 2004). Government can either directly or indirectly affect the adoption of E-banking in terms of creating a favorable environment and impetus for banking institutions and their customers so that the services can be diffused with the community (Kuan and Chau, 2001). The digital transformation concept would be the central focus of the study, and the framework would explore

the various ways in which digital technology has transformed the financial sector in Ethiopia. This could include the adoption of mobile banking, online payments, and other digital financial services, as well as the impact of these technologies on traditional banking practices (Asif et al, 2023). The policies Also, the regulatory system that controls the banking sector is critical for digital transformation. The framework would explore the role of these institutions in driving digital transformation.

Without ICT resources, digital transformation in the financial sector would not be feasible. The network and electricity system for providing financial technology products and services using digital channels are based on ICT technology (Hang, 2021). The financial sector in Ethiopia would be another important concept to consider. This would include the banking institutions in the country. Human resources: Highly trained human resource is core point of digital transformation for technology user and providers; these resources include policy maker, technician, and change management skills in transforming and maximizing digital literacy.

Overall, the conceptual framework for this research study would be designed to provide a comprehensive understanding of digital transformation in Ethiopia's financial.

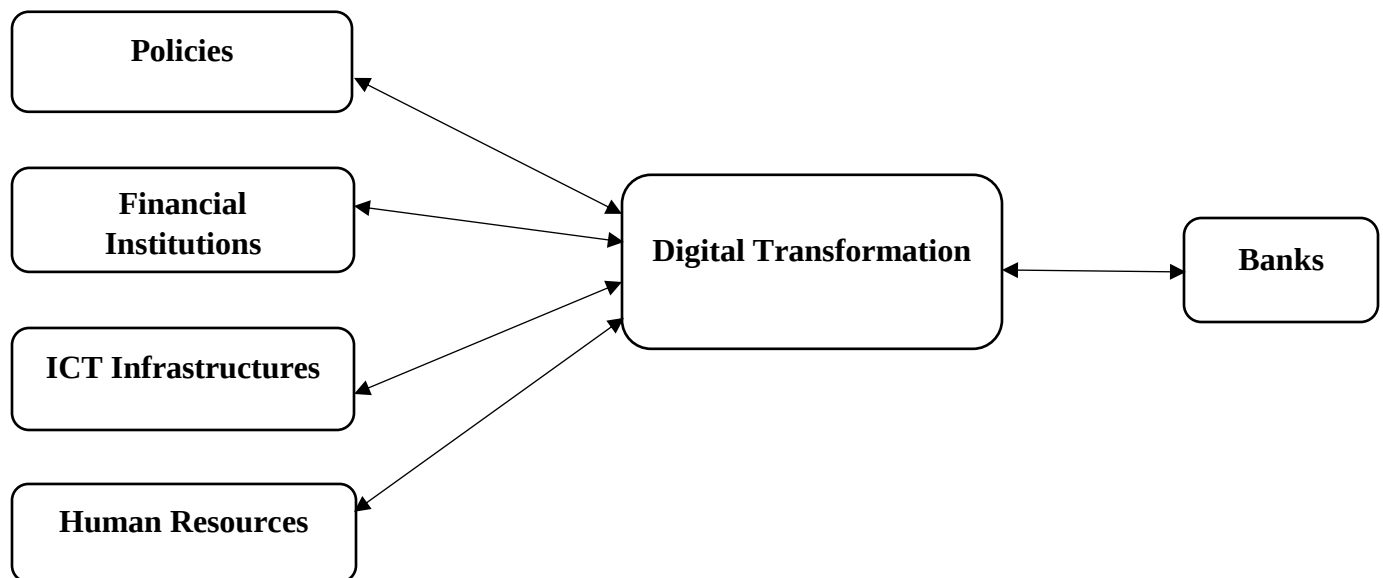


Figure 1: Study's Conceptual framework (own design).

CHAPTER THREE

3. Methodology

This study is a mixed research using both quantitative and qualitative methods. The quantitative method corresponds to the analysis of Ethiopia's status as compared to African countries financial digitalization, which is the second research question or objective. With regards to the qualitative approach, case studies are intended to be carried out at banks that have branches operating in Adama City. In regards to the first and third objectives of the research, the study is designed as qualitative study which is used to explore the relevant and pertinent information related to government's role in digital transformation. The specific methodologies are discussed below.

3.1 Sampling method

To conduct the research ten (10) banks' branch that are located in Ethiopia has been purposively selected as a source of primary data based on profit they generated in 2022. The reason to use only ten banks' branches in Ethiopia under selected 10 banks based on their profit is; they are too many to include all branches and all banks in Ethiopia because of budget. The selected banks Namely, Commercial Bank of Ethiopia (CBE), Cooperative Bank of Oromia(CBO), Bank of Abyssinia(BOA), Nib International Bank(NIB), Awash Bank, Dashen Bank, Zemen Bank, Hibret Bank, Oromia Bank, Abay Bank. In line to this from ten banks twenty (20) respondents's participated. From 20 percipients, One Manager and one officer selected from each bank. Totally, twenty respondents Participated on this research. Therefore, convenience sampling technique has been used in the study. The reason to use convenience sampling is because the banks' branches in Ethiopia under selected 10 banks are too many to include all and they have the same services under each branch's.

3.2 Research Design

In this research, descriptive research has been used that involves describing a problem, context, or situation. This is a feature of exploratory research that the researcher uses; however, descriptive-type questions are more structured and more reliant on prior ideas and methods. So, the knowledge that has been obtained in the thesis is mainly based on primary research data. This research was conducted on the assessment of digital transformation in the financial sector, mainly in Ethiopia's

banks. Hence, in order to solve the research gap that is discussed in the statement of problem and the thesis relied on primary and secondary data.

3.3 Data Collection Method

To accomplish the stated objectives, the researcher has used both primary and secondary data. The primary data that shows the challenges that banks face in transitioning to digitalization and the digital products and services they provide on selected ten banks. Primary data have been collected using structured interviews that contain both closed and open-ended questions and interviews using unstructured interview guides or schedules. Those selected banks are selected based on the performance they scored in 2022. And additional data from secondary sources like different national banks, the World Bank, the IMF, the ITU, the GSM Association, etc.

3.4 Data Analysis Method

The data to be obtained from secondary sources and qualitative interviews with ten banks has been analyzed using their respective methods. Quantitative analysis will be used to analyze secondary data obtained from different National Bank of Ethiopia and international databases. In order to ensure logical completeness and consistency of responses, data editing and coding have been done by the researcher. Once editing is done, the data has been analyzed qualitatively, which was obtained through different data collection instruments. Qualitative data from semi-structured interviews and secondary documents has been used to assess the status of the regulatory environment and the effectiveness of the government's digitalization strategies.

CHAPTER FOUR

4. Data Analysis and Discussion

4.1 Introduction

This chapter is devoted to discussing the policy, and regulatory foundations of digital banking in Ethiopia in order to ascertain the extent to which it addresses issues raised by the adoption of digital banking products and services, particularly those issues affecting digital transformation in banking sector and analysis of the digital banking structure across various levels within the selected banks with their products and services they adopted. This chapter is divided into three major parts, each contains sections and sub-sections; part-one deals with the constitutional framework, policy framework, part-two deals with the analysis of the digital banking structure across various levels within the selected banks with their products and services they adopted. Part three deals with the level of Ethiopian technology transformation compared to other African country.

4.2 Constitutional framework of digital banking

As 1995 FDRE Constitution, Art 51(7), the Constitution mandated the Federal Government with the power to administer the National Bank, print and borrow money, mint coins, regulate foreign exchange and money in circulation.

According to the FDRE Constitution, the power to enact policies and laws on matters relating to digital banking lies with the Federal Government; not with states or federal government. Again, from among the Federal Government organs, it is the HOPR who has the power to issue the policies and laws relating to e-banking regulations. (FDRE Constitution, Art 55(10)). Moreover, both the Council of Ministries and the National Bank have a delegated legislative power to enact regulations and directives that regulate the e-banking products and services respectively (National Payment System Proclamation, Art 37(1) & (2)).

With regard to the enforcement institutions, Article 77(4) of the Constitution, as well as proclamation No.591/2008, empowers the Council of Ministers and National Bank of Ethiopia to enforce the laws issued by the legislative organ of the government. Thus, the FDRE Constitution

clearly sets the layer and institutions of government that have power and authorities over electronic banking regulation.

4.3 The legal framework of digital banking regulation

The electronic provision of banking products and services is regulated by different legal documents. The major legal documents that regulate digital banking are the constitution, primary legislation(proclamation), secondary legislation (regulations and directives). The constitutional framework is discussed in the above section 4.2 which determines both the policy and legal framework of the digital banking regulations. Following the constitution, the main primary legislation that regulates e-banking is the National Payment System Proclamation 718/2011.

In addition to this, some legal provisions of the primary legislation of Banking Business Proclamation, Computer Crime Proclamation, Anti-Money Laundering, and Terrorism Financing Proclamation, Commercial Code, Civil Code, Extraordinary Issue No.1, Article 1749 & 1750, Amended National Bank Establishment Proclamation and Criminal code of The Federal Democratic Republic of Ethiopia Proclamation No. 414/2004 have right in regulating digital banking business.

Regulation of Mobile and Agent Banking Services Directive No. FIS/01/2012, Fraud Monitoring Directive No. SBB/59/2014, Circular No. FIS/01/2014, and Circular No. FIS/02/2014 regulates the digital banking business in Ethiopia included within the secondary legislation.

The financial institutions, namely, banks and microfinance, which are already established to provide traditional banking services are the institutions which are allowed to provide digital banking products and services to their customers.

As the banks are engaged in traditional and digital services, the provision of these services is controlled by the traditional and digital banking legal frameworks. The traditional banking services are mainly regulated by the Commercial Code and the Banking Business Proclamation No. 591/2008, but the digital banking regulation is mainly regulated by the National Payment System Proclamation No 718/2011 and its implementing directives. National Payment System Proclamation, which comprises six parts. The six parts of the proclamation are: Part one General Part; Part two: Powers and Duties of the National Bank, and Issuance of Authorization; Part three:

Settlement, Netting and Finality; Part four: Electronic Fund Transfer; Part five: Regulation and Oversight and Part Six: Miscellaneous Provisions and 39 provisions, is primarily intended to regulate the national payment system. As part of the national payment system, it also regulates digital banking products and services as well as sets the powers and functions of the enforcement organs.

However, the National Payment System Proclamation delegates most aspects of e-banking to be regulated by directives that was expected to be issued by the NBE, but, most of the supposedly implementing directives that were expected to be issued by the NBE has not yet issued with the exception of Mobile and Agent Banking Directive and some circular letters which clarifies the Directive.

4.3.1 Terms and regulation of digital bank products and services

Article 19(1) of the NPS Proclamation mandates commercial banks to provide standardized conditions and terms for electronic fund transfers and stored value cards that apply to all of their clients without discrimination.

As stated in Art 19(2) of the National Payment System Proclamation, commercial banks are required to establish distinct standard terms and conditions for mobile banking, Internet banking, ATM banking, POS services, mobile-money, and mobile wallet. The standard terms and conditions are subject to NBE approval for use by banks Proclamation. Even if commercial banks wish to amend the usual terms and conditions of digital banking, they must first obtain clearance from the NBE. By a directive, the NBE is a delegate to set the basic terms and conditions of digital banking service agreements. However, the NBE neglected to include rules that control the fundamental terms and conditions in the Regulation of Mobile and Agent Banking Service Directive. In line with this, The Draft EFT Directive, Art 7.3 obligation of disclosure is extended up to the delivery of the copy of the digital banking service agreement to the customer prior to or at the time of initial use of electronic payment instrument, and at any other time requested to do so by the customer. The banks are also obliged to avail the standard terms and conditions at all branches and their agents as maintained by Draft EFT Directive, Art 7.4. Also, the Draft EFT Directive, 7.5 state that standard terms and conditions should be also in writing, prepared in Amharic or any other language that the customer understands.

As it is mentioned in the above, as far as the standard terms and conditions is concerned the ongoing directive does not provide adequate regulations. Again, Draft Directive, has failed to regulate some important issues of the digital banking service agreements; thus, the current regulation is surrounded by the following legal and practical limits: **First**, as it is mentioned in the above, the NBE is delegated to determine the basic terms and conditions of the e-banking service agreements by a directive, but the NBE has not yet issued a directive. The current directive, Regulation of Mobile and Agent Banking Service Directive, does not regulate the basic terms and conditions of the e-banking service agreements. Having identified the drawback of the ongoing directive, the Draft Directive regulates the minimum contents of the terms and conditions of the digital banking service agreements. But, there is no binding directive that regulates the basic terms and conditions of the digital banking agreements. Researcher found that, the selected ten commercial banks are arbitrarily preparing the standard terms and conditions of the digital banking service agreements for their customer.

Secondly, even the application form where commercial banks require signature as a standard terms and conditions is only prepared in Amharic and English. According to the current directive, there is no rule that requires commercial banks to produce standard terms and conditions in languages other than Amharic and English. However, because the ultimate purpose of the fundamental terms and conditions is to raise consumer knowledge of their rights and duties, it would be preferable if it was created in the language that the customers speak. Customers were able to read and comprehend.

4.3.2 Fraud regulation of digital banking products and services

Subscribers of digital banking are experiencing financial losses as a result of payment instrument fraud. In terms of payment instrument fraud and incorrect handling, the present legislation, the NPSP and the Regulation of Mobile and Agent Banking Service Directive, are deafeningly silent. However, unlike the Regulation of Mobile and Agent Banking Service Directive, the Draught Directive controls fraudulent digital banking transactions implicitly. According to the Draft EFT As stated under payment instrument directives Art 25.1-25.5, banks are required to reimburse losses incurred as a result of: unauthorized electronic fund transfer services; unauthorized digital currency transfer services; activities that are not caused to or initiated by the consumer; dishonest

or irresponsible bank behavior, or agents of the bank; forged, faulty, or expired ATM cards; and before the customer has received the payment instrument. And, the Draft Directive, Draft EFT Directive, Art 2.30 defines, ‘unauthorized electronic fund transfer’ as, “...an electronic fund transfer service from an accountholder’s account initiated by a person other than the accountholder without actual authority to initiate such services and from which the accountholder receives no benefit.”. This is the general standard that the Draft Directive provides as a means to differentiate the authorized transactions from the fraudulent transactions. First, it is obvious that once the true cardholder withdraws or transfers funds using the true card, mobile banking and its corresponding password, there is no more fraudulent transaction. It is to deter this type of fraud that the Draft Directive dictates that a cardholder cannot claim compensation under the guise of fraudulent transaction for withdrawals made by him.

Similarly, in the second situation, once the cardholder directly or implicitly authorizes a third-party (agent) to withdraw or transfer funds to another party, the transaction is complete. In this regard, the Draught EFT Directive (Article 26.1(a)) is silent on the conditions that demonstrate concert practice, but it generally regulates that any digital banking transaction is considered an authorized digital banking transaction if the person initiates, processes, and executes such digital banking transaction using the accepted means of access card, internet banking, or mobile banking and its correspondent PIN or password.

Thus, in determining the authorization of the digital banking transaction, the identity of the person is not required rather the identity of card and its correspondent password is required. From this, we can say that where a cardholder intentionally or negligently accesses or cause to be accessed his payment instrument and its correspondent password, such transaction is considered as an authorized transaction and the bank is relieved from the losses occurred due to such problems.

As a result, every transaction performed utilizing the accepted method of access and its correspondent is deemed a transaction done by the genuine cardholder or other channel of digital banking access, regardless of who originates, processes, and executes the transaction. However, in contrast to the fraud case mentioned above, according to Draught EFT Directive, Art 25.1-25.5, the bank is liable for losses caused by: acts not attributed to or contributed to by the customer; namely, fraudulent or negligent conduct of the bank, technology service provider, or agents of the bank; and use of forged, faulty, or expired payment instruments.

4.3.3 Transaction limits of digital banking products and services

The Ethiopian legal system recognizes the transaction limit's function in mitigating financial losses and implements laws correspondingly. In accordance with Art. 5.1 and 5.2 of the Administration of Mobile and Agent Banking Operations Under EFT Directive, the maximum amount of money that may be put in a customer's 'mobile account' is Birr 25,000, and the maximum amount of money that can be moved and/or withdrawn during a day is Birr 6,000. However, these limitations have been revoked by Circular No. FIS/02/2014, and according to Circular No. V/GOV/017/2014, financial institutions must determine both deposit and daily transaction limits through internal regulations. However, in terms of deposit and transaction restrictions for agent banking services, the regulation given by the Regulation of Mobile and Agent Banking Service Directive.

Also, the above electronic limit is replaced by Amendment Licensing and Authorization of Payment Instrument Issuer Directive No ONPS/01/2020 this includes:

Transaction limits: Level 1 accounts:

- Maximum account balance: Ethiopian Birr 5,000
- Aggregate daily transaction limit: Ethiopian Birr 1,000
- Aggregate monthly transaction limit: Ethiopian Birr 10,000

b. Level 2 accounts:

- Maximum account balance: Ethiopian Birr 20,000
- Aggregate daily transaction limit: Ethiopian Birr 5,000
- Aggregate monthly transaction limit: Ethiopian Birr 40,000

c. Level 3 accounts:

- Maximum account balance: Ethiopian Birr 30,000
- Aggregate daily transaction Limit: Ethiopian Birr 8,000
- Aggregate monthly transaction Limit: Ethiopian Birr 60,000

In terms of transaction limits, the Draught Directive maintains what is stated by Circular No. FIS/02/2014; and consequently, Draft EFT Directive, Art 35.1 states that financial institutions shall determine the transaction limits of ATM, POS, mobile-banking, internet-banking, m-money, and m-wallet transaction based on risk assessment and business suitability. However, despite the Circular, Art 35.1 of the Draft Directive requires financial institutions to inform the NBE of

transaction restrictions. Furthermore, the NBE may determine the transaction limitations of digital banking transactions based on its own start under this directive, Art 35.2 of the Draught Directive. As clarification of the Draft EFT Directive's transaction limit regulation, Art 7.5(d), the Directive mandates financial institutions to include the transaction limitations of digital banking goods and services in the terms and conditions of the agreements. According to Draught EFT Directive, Art 9.1(c), financial institutions are also required to notify clients of changes to transaction limitations. Finally, because the ultimate goal of transaction limits is to mitigate financial losses that may occur as a result of fraudulent transactions, the bank's customer is not liable for financial losses that exceed the daily transaction limit as maintained under Draught EFT Directive, Art 26.2(a)) and replaced by Directive No ONPS/01/2020.

4.3.4 Price regulation of digital payments

There are four sorts of fees in electronic banking services. The first two, issuance and renewal fees, are associated with the establishment and renewal of payment instruments such as debit or credit cards. The third and fourth costs, on the other hand, are related with electronic banking transactions and ensuring payment systems run properly. These fees cover the costs of performing e-banking transactions and promoting payment system interoperability.

The NBE has stated negligibly stated fees for e-banking transactions, related to electronic banking product and service prices, Art 4(2)(d)(3) of the NPSP guidelines requires the NBE to implement directives for digital banking product and service charges. But it has not directly expressed its intention to regulate the price of electronic banking products and services by requiring commercial banks to submit their pricing strategy along with the policy documents specified in Directives No. FIS /01/2012, Art. 6.3(iii)). The price strategy, according to this article, should include the first fees and charges while keeping the sustainability and affordability of the e-banking product and services in consideration. Additionally, the ongoing Directives No. FIS /01/2012, Art 12.7 only mandates the financial institution to disclose the prices of the e-banking products and services at the time of conclusion of the e-banking contract. Thus, the ongoing regulation is not enough adequate. Having recognized the drawbacks of the current regulation, the Draft Directive, provides a detail regulation for the prices of the e-banking transactions. As per the Draft EFT Directive, Art 8.1, the financial institution has the obligation to notify to the NBE about the initial amount of fee and any change thereof imposed on any e-banking products and services. The Draft EFT

Directive, Art 8.2(a & b) states financial institution has also the obligation to notify the imposition of fees and its amount to the customer

According NBE Directive, the fees charged by banks should be disclosed to customers by posting in visible location where the customer initiates the digital payment transactions and on ATM machines, on the screen of the device used for the transaction stated under Draft EFT Directive, Art 8.3(a) and Art 8.3(b). Under Draft EFT Directive, Art 8.3(b) the notification should be after the initiation of the digital payment transaction and before the customer confirms the transaction (Draft EFT Directive, Art 8.3(b)). These are the only issues regulated by the Draft Directive, the price regulation is surrounded by the following limits: Firstly, the NBE is delegated to issue a directive as to the amount of charges associated with digital payment channels, but till this time the NBE didn't issued a directive that regulates the said charges. Thus, as it is mentioned in the above, the NBE is only using the price strategy to regulate the price of the electronic banking products and services. Second, as per the Draft Directive, the banks have only the obligation to notify the initial fees and the changes made thereof to the NBE. Thus, the NBE is only entrusted to accept the notification: it is not empowered to reject the charges where it believes that such charges are unreasonable.

4.3.5 Regulation of ATM reconciliation and refund of funds

According to licensing and authorization of payment system operators Directives NO. ONPS/02/2020 under article 11.2(e), the directive mandates that financial institutions must promptly reconcile and refund any funds belonging to a customer in the event of an automated Teller machine (ATM) non-dispense error. The timeframes for reconciliation and refund are specified as follows:

Off-Us Transactions: Financial institutions are required to reconcile and refund funds within 72 (seventy-two) hours for transactions that occur outside their own network (off-us).

On-Us Transactions: For transactions that take place within the financial institution's network (on-us), the reconciliation and refund must occur within 6 (six) hours.

However, from twenty participants used in interview they indicate that banks are not adhering to this directive. They are not reconciling and refunding funds within the specified timeframes for

both off-us and on-us transactions. This non-compliance with the directive raises concerns about customer service and regulatory adherence. Failure to reconcile and refund funds promptly can negatively impact customers who rely on ATM services and trust the technology they are using.

To address this issue, it is crucial for the relevant regulatory authorities NBE to ensure or follow-up that financial institutions comply with the directive. This may involve conducting audits, imposing penalties for non-compliance, or providing clearer guidelines and mechanisms for reconciliation and refunds.

4.4 Legal framework of ATM and virtual banking

The current legal framework does not say nothing about virtual bank establishment. Based on Licensing and authorization of payment system operators Directives NO. ONPS/02/2020, Art 11.6. The directive provided outlines the services that automated teller machines (ATMs) in Ethiopia are allowed to offer. It lists several services, including process payments through international card scheme, account to account transfer, card to card transfer, mobile top-up, bill payment, domestic remittance; and other related services as approved by the National Bank that only applies for ATM. But, for the first time in 2020, Bank of Abyssinia bank introduced a virtual bank in Ethiopia. The new virtual banking offers banking services through electronic machines called ITM (interactive teller machine). Virtual banking is performed online with 24/7 instant support from contact center team from head office (BOA, 2022). The new virtual banking services features are: collection of cash for deposit to local currency account, collections of foreign currency cash to deposit to ,foreign currency account, purchase FCY cash notes ,purchase FCY cash notes ,collection of cheque and banker's cheque ,cash payment from saving account ,cash payment from LCY/ FCY current accounts and bankers cheque ,payment for local money transfer ,payment through fund transfer within boa or another bank and customer acquisition and digital products (BOA, 2022).

According to Licensing and authorization of payment system operators Directives NO. ONPS/02/2020, 11.6 (a & b) a licensed automated teller machine operator under full responsibility of and written outsourcing agreement with regulated financial institutions and Forex bureaus, may be allowed to provide the following services on automated teller machine: foreign currency exchange; and accepting deposit respectively. But, this directive nothing says about whether the ongoing regulation used for Virtual banking.

Based on Licensing and authorization of payment system operators Directives NO. ONPS/02/2020, Art 4.7 (c), specifies a paid-up capital requirement of not less than 20 million ETB (twenty million Birr) for applicants seeking to be licensed as payment system operators, specifically for automated teller machine (ATM) operators. However, it doesn't explicitly mention the paid-up capital requirement for virtual banking operators.

4.5 Analysis of digital banking structure and adopted technologies

4.5.1 Digital banking structure in organizational level

The provided data under table 1 presents a list of banks along with their digital banking structures, indicating whether they have implemented digital banking services or not.

Table 1: Digital banking structure in organizational level

No.	List of Bank	Digital banking structure
1	CBE	yes
2	CBO	Yes
3	BOA	yes
4	NIB	Yes
5	Awash Bank	Yes
6	Dashen Bank	Yes
7	Zemen Bank	yes
8	Hibret Bank	Yes
9	Oromia Bank	yes
10	Abay Bank	yes

Source: Survey result (2023)

Analyzing this information deeply, we can gain insights into the widespread adoption of digital banking among these banks. all ten banks in this list, namely CBE, CBO, BOA, NIB, Awash Bank, Dashen Bank, Zemen Bank, Hibret Bank, Oromia Bank, and Abay Bank, have adopted digital banking structures, as indicated in the table. This signifies that these banks have integrated digital channels and services into their operations, allowing customers to conduct various banking activities online and through mobile platforms and other channels. This widespread adoption of digital banking reflects the banking industry's recognition of the importance of providing convenient and accessible services to customers in an increasingly digital world. This comprehensive adoption of digital banking reflects the recognition of its significance in the modern

banking landscape. It also demonstrates how financial institutions are adapting to the evolving needs and preferences of their customers.

4.5.2 Adoption of digital banking to traditional banking

The provided data under table 2 presents a list of banks along with information about whether they have adopted digital banking in addition to their traditional banking services. Analyzing this data more deeply reveals the extent of digital transformation within the banking sector and its implications for customer service and operational efficiency.

Based on the information provided, all ten banks have implemented digital banking in addition to their traditional banking services. This comprehensive adoption of digital solutions across the listed banks signifies a significant shift in the banking industry towards embracing technology to cater to modern customer needs and expectations.

Table 2: Adoption of digital banking to traditional banking

No.	List of Bank	Adoption of digital bank additional to traditional bank
1	CBE	yes
2	CBO	yes
3	BOA	yes
4	NIB	yes
5	Awash Bank	yes
6	Dashen Bank	yes
7	Zemen Bank	yes
8	Hibret Bank	yes
9	Oromia Bank	yes
10	Abay Bank	yes

Source: Survey result (2023)

4.5.3 Digital banking structure at head office level

Among the ten banks listed, nine of them, namely CBE, CBO, BOA, NIB, Awash Bank, Dashen Bank, Hibret Bank, Oromia Bank, and Abay Bank, have established a digital department at their head office, as indicated in the table 3. These banks have recognized the significance of having a dedicated department to oversee and drive their digital banking initiatives, which is crucial in today's tech-driven banking landscape. However, Zemen Bank is the exception in this case, as it does not have a designated Digital department at its head office.

Table 3: Digital banking structure at head office level

No.	List of Bank	Digital department at head office
1	CBE	yes
2	CBO	yes
3	BOA	yes
4	NIB	yes
5	Awash Bank	yes
6	Dashen Bank	yes
7	Zemen Bank	No
8	Hibret Bank	yes
9	Oromia Bank	yes
10	Abay Bank	yes

Source: Survey result (2023)

4.5.4 Digital banking structure at district level

Based on the provided data under table 4 from ten banks, nine (9) of them have added digital transformation by establishing a digital department at the district level. These banks include the CBE, CBO, BOA, NIB, Awash Bank, Dashen Bank, Hibret Bank, Oromia Bank, and Abay Bank, all of which have a digital department at the district level. But, there is one bank, Zemen Bank, that does not have a digital department at the district level based on the given data.

Table 4: Digital banking structure at district level

No.	List of Bank	Digital department at the district level
1	CBE	yes
2	CBO	yes
3	BOA	yes
4	NIB	yes
5	Awash Bank	yes
6	Dashen Bank	yes
7	Zemen Bank	No
8	Hibret Bank	yes
9	Oromia Bank	yes
10	Abay Bank	yes

Source: Survey result (2023)

4.5.5 Digital banking structure at branch level

According table 5 shows, nine (9) of them do not have a dedicated digital officer at the branch level. Banks such as Commercial Bank of Ethiopia (CBE), Central Bank of Oman (CBO), Bank of Abyssinia (BOA), Nib International Bank of Ethiopia (NIB), Dashen Bank, Zemen Bank, Hibret

Bank, Oromia Bank, and Abay Bank, have no a digital banking officer at the branch level. However, Awash Bank stands out as an exception, having a dedicated digital banking officer in place at the branch level.

Table 5: Digital banking structure at branch level

No.	List of Bank	Digital banking officer at the branch level
1	CBE	No
2	CBO	No
3	BOA	No
4	NIB	No
5	Awash Bank	Yes
6	Dashen Bank	No
7	Zemen Bank	No
8	Hibret Bank	No
9	Oromia Bank	No
10	Abay Bank	No

Source: Survey result (2023)

4.5.6 Digital banking department at head office level

As table 6 shows, all the listed banks, including Commercial Bank of Ethiopia (CBE), Cooperative bank of Oromia (CBO), Bank of Abyssinia (BOA), NIB, Awash Bank, Dashen Bank, Zemen Bank, Hibret Bank, Oromia Bank, and Abay Bank, have confirmed that they possess a related department for technology transformation and innovation management at their respective head offices.

Table 6: Digital banking department at head office level

No.	List of Bank	Digital banking related department with technology transformation, innovation management at head office
1	CBE	Yes
2	CBO	Yes
3	BOA	Yes
4	NIB	Yes
5	Awash Bank	Yes
6	Dashen Bank	Yes
7	Zemen Bank	Yes
8	Hibret Bank	Yes
9	Oromia Bank	Yes
10	Abay Bank	Yes

Source: Survey result (2023)

This collective affirmation demonstrates the banks' commitment to embracing technological advancements and fostering innovation within their organizations. By having dedicated departments focused on technology transformation and innovation management, these banks are better positioned to adapt to the rapidly changing financial landscape, enhance their digital capabilities, and deliver innovative solutions that cater to the evolving needs of their customers.

4.5.7 Adopted digital banking technology

All ten (10) banks in the list have adopted essential digital banking technologies, including Internet Banking, Mobile Banking, ATM, and POS services. These technologies are now standard offerings in the modern banking landscape for CBE, CBO, BOA, NIB, Awash Bank, Dashen Bank, Zemen Bank, Hibret Bank, Oromia Bank, and Abay Bank.

Nine (9) out of the ten banks, namely CBE, CBO, BOA, NIB, Awash Bank, Dashen Bank, Hibret Bank, Oromia Bank, and Abay Bank, have also embraced the use of Mobile Money and Agency Banking services, indicating their commitment to providing customers with convenient and accessible banking options.

Interestingly, only BOA has implemented Virtual banking or ITM (Interactive Teller Machine) technology, which represents a more advanced and interactive form of banking technology (see table 7).

Table 7: Adopted digital banking technology

Adopted Technology	List of Bank									
	CBE	CBO	BOA	NIB	Awash Bank	Dashen Bank	Zemen Bank	Hibret Bank	Oromia Bank	Abay Bank
Internet Banking	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mobile Banking	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ATM	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ITM (Interactive teller machine)	No	No	Yes	No	No	No	No	No	No	No
POS	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mobile Money	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Agency banking	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes

Source: Survey result (2023)

4.5.8 Adoption of core banking system

The selection of core banking systems by Ethiopian banks in table 8 carries significant implications for their operational efficiency, digital capabilities, and overall competitiveness. Notably, Temenos T24 emerges as a favored choice among several banks, including Commercial Bank of Ethiopia (CBE), Abyssinia Bank, COOP and NIB, indicating its recognition for scalability and versatility in supporting a wide spectrum of banking services.

Conversely, Oracle FLEXCUBE Universal Banking is preferred by Dashen Bank, Zemen Bank, and Abay Bank for its adaptability and capacity to cater to diverse banking needs. Hibret Bank's adoption of Oracle Banking Digital Experience (OBDX) underscores its commitment to digital transformation, prioritizing modern and user-centric digital banking experiences.

Meanwhile, Oromia Bank's choice of ICS Financial Systems (ICSFS) suggests an emphasis on customization and adaptability to address specific banking requirements.

This diversity in technology adoption reflects the Ethiopian banking sector's strategic alignment of core banking systems with their unique operational priorities, customer service objectives, and digital transformation strategies. It also presents potential opportunities for collaboration and interoperability, benefiting both customers and the broader financial ecosystem in Ethiopia. Ultimately, these technology choices will play a pivotal role in shaping the banks' competitiveness in an increasingly digitalized financial landscape.

Table 8: Adopted core banking system

No.	Bank name	Adopted core banking system
1	CBE	Temenos T24
2	Awash bank	Fusion Essence Core banking
3	Abyssinia bank	Temenos T24
4	Dashen bank	Oracle FLEXCUBE Universal Banking
5	COOP	Temenos T24
6	NIB	Temenos T24
7	Zemen bank	Oracle FLEXCUBE Universal Banking
8	Hibret bank	Oracle Banking Digital Experience (OBDX)
9	Oromia bank	ICS Financial Systems (ICSFS)
10	Abay bank	Oracle FLEXCUBE Universal Banking

Source: Survey result (2023)

4.5.9 Services under internet banking

The analysis of internet banking services offered by the listed banks reveals varying degrees of digitalization and customer-centricity in their offerings. Based on table 9 Let's examine each service:

Check balance: All ten banks, including CBE, CBO, BOA, NIB, Awash Bank, Dashen Bank, Zemen Bank, Hibret Bank, Oromia Bank, and Abay Bank, offer the service of checking your account balance through their internet banking platforms.

View account: Similarly, all ten banks enable customers to view their account details online, providing easy access to account information.

Statement control progress: Statement control progress is available through only 3 banks (NIB, Dashen Bank and Zemen Bank) allowing customers to track their financial statements and other seven banks CBE, CBO, BOA, Awash Bank, Hibret Bank, Oromia Bank, and Abay Bank doesn't offer this service.

Pay bills: Under this service 6 banks namely CBE, CBO, Dashen Bank, Zemen Bank, Hibret Bank, and Abay Bank provide bill payment services through their internet banking platforms, making it convenient for customers to settle various bills online and other 4 banks BOA, NIB, Awash Bank and Oromia Bank excluded from Bill payment through Internet Banking.

Bank to bank transfer: From Ten banks 6 banks, including BOA, Awash Bank, Dashen Bank, Zemen Bank, Hibret Bank, and Abay Bank, facilitating interbank transfer, while four of CBE, CBO, NIB and Oromia Bank do not offer this service.

Account to account transfer: All banks, including CBE, CBO, BOA, NIB, Awash Bank, Dashen Bank, Zemen Bank, Hibret Bank, Oromia Bank, and Abay Bank, allow customers to perform account-to-account transfers within their banks.

Exchange rates: Exchange rate information is available through 5 banks, namely NIB, Zemen Bank, Hibret Bank, Oromia Bank, and Abay Bank, aiding customers in currency-related rates. whereas CBE. CBO, BOA, Awash Bank and Dashen Bank do not offer this feature.

Table 9: Services under internet banking

No.	Services under internet banking	List of Banks									
		CBE	CBO	BOA	NIB	Awash Bank	Dashen Bank	Zemen Bank	Hibret Bank	Oromia Bank	Abay Bank
1	Check balance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	View account	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	Statement control progress	No	No	No	Yes	No	Yes	Yes	No	No	No
4	Pay bills	Yes	Yes	No	No	No	Yes	Yes	Yes	No	Yes
5	Bank to bank transfer	No	No	Yes	No	Yes	Yes	Yes	Yes	No	Yes
6	Account to account transfer	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7	Exchange Rates	No	No	No	Yes	No	No	Yes	Yes	Yes	Yes
8	ATM card management	No	No	No	No	No	No	No	Yes	No	Yes
9	Bulk transfer	No	No	Yes	No	No	No	No	Yes	Yes	No
10	Standing orders	Yes	No	Yes	No	Yes	No	No	Yes	Yes	No
11	Cheque services	No	No	Yes	No	No	No	Yes	Yes	Yes	Yes
12	Mobile top up	No	No	No	No	No	Yes	No	Yes	Yes	No
13	Mini statement	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes
14	Utilities payment	Yes	No	No	No	No	Yes	No	Yes	No	Yes
15	Pay and manage beneficiary	Yes	No	Yes	Yes	Yes	Yes	No	No	No	No
16	Check branch/ATM locations	No	No	No	No	No	No	No	Yes	Yes	No

Source: Survey result (2023)

ATM card management: Only 2 banks Hibret Bank and Abay Bank offer ATM card management services through their internet banking platforms, providing convenience in card-related services.

Bulk transfer: From selected ten banks listed in the table only three (3) banks support Bulk transfers are facilitated by BOA, Hibret Bank, and Oromia Bank through their internet banking services.

Standing orders: Five banks CBE, BOA, Awash Bank, Oromia Bank and Hibret Bank offer standing order services, allowing customers to set up recurring payments easily.

Cheque services: Five Banks BOA, Zemen Bank, Hibret Bank, Oromia Bank, and Abay Bank provide various cheque-related services through their internet banking platforms.

Mobile top up: As table 9 nine data from selected ten banks listed in table nine only 3 banks Hibret Bank, Oromia Bank and Dashen Bank offers mobile top-up services, enabling customers to recharge their mobile phones online.

Mini statement: From selected ten banks listed in table nine only even banks CBE, CBO, BOA, Dashen Bank, Hibret Bank. Oromia Bank, and Abay Bank offer mini statement services, giving customers a quick overview of their recent transactions.

Utilities payment: From selected ten banks listed in table nine only four banks CBE, Dashen Bank, Hibret Bank, and Abay Bank support utilities payments, making it convenient for customers to pay for essential services online.

Pay and manage beneficiary: Five banks CBE, BOA, NIB, Awash Bank and Dashen Bank offer services to pay and manage beneficiaries, simplifying fund transfers.

Check branch/ATM locations: From selected ten banks listed in table nine only two banks Hibret Bank and Oromia Bank, assist customers in locating branches and ATMs through their internet banking platforms.

4.5.10 Channel of accessing Mobile banking

Table 10 shows that all the banks have demonstrated a strong commitment to mobile banking by offering multiple channels for accessing their services, including CBE, CBO, BOA, NIB, Awash Bank, Dashen Bank, Zemen Bank, Hibret Bank, Oromia Bank, and Abay Bank, have implemented both USSD (Unstructured Supplementary Service Data) and mobile application-based mobile banking.

Table 10: channel of accessing Mobile banking

List of banks	channel of accessing mobile banking	
	USSD Application	Mobile Application
CBE	Yes	Yes
CBO	Yes	Yes
BOA	Yes	Yes
NIB	Yes	Yes
Awash Bank	Yes	Yes
Dashen Bank	Yes	Yes
Zemen Bank	Yes	Yes
Hibret Bank	Yes	Yes
Oromia Bank	Yes	Yes
Abay Bank	Yes	Yes

Source: Survey result (2023)

These banks have taken substantial steps to make banking services more accessible and user-friendly. Their adoption of both USSD and mobile application-based mobile banking showcases a progressive approach to financial services, allowing a broader segment of the population to access and benefit from banking services.

4.5.11 Integrated Card networks

The responses presented in table 11 in relation to questions on the use of integrated card networks reveals some interesting trends. Firstly, Mastercard integrated card network appeared to be the most used as all (CBE, CBO, BOA, NIB, Awash Bank, Dashen Bank, Zemen Bank, Hibret Bank, and Oromia Bank) except Abay Bank have been integrated with the network.

Table 11: Integrated Card networks

No.	Integrated Card networks	List of Banks									
		CBE	CBO	BOA	NIB	Awash Bank	Dashen Bank	Zemen Bank	Hibret Bank	Oromia Bank	Abay Bank
1	American Express	No	No	No	No	No	Yes	No	No	No	No
2	Discover	No	No	No	No	Yes	No	No	No	No	No
3	Mastercard	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
4	Union Pay	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
5	Visa card	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
6	JCB	No	No	No	No	Yes	No	No	No	No	No
7	Diner club card	No	No	No	No	Yes	No	No	No	No	No

Source: Survey result (2023)

Secondly, The Union Pay card network is also well-supported, with six banks (CBE, CBO, BOA, NIB, Awash Bank and Dashen Bank) offering integration. However, four of the banks including Zemen Bank, Hibret Bank, Oromia Bank, and Abay Bank do not support Union Pay. Third, eight banks (CBE, CBO, BOA, NIB, Awash Bank, Dashen Bank, Zemen Bank and Hibret Bank) connecting to Visa card network.

Abay Bank and Oromia banks is does not integrated to their networks. Lastly, Awash bank stands out by integrating with six networks. American Express supported by Dashen Bank only. Additionally, Awash Bank is the sole institution integrating with the Diner Club card and JCB network.

4.5.12 Services under ATM

The table 12 reveals that core ATM services such as cash withdrawals, transferring funds, print balance statement and checking balances are universally available across all the ten listed banks. However, supplementary services like mobile top-up, bill payments, and depositing cash are not offered by any of the ten banks. Card-less cash withdrawals are available at some of the five banks (CBE, BOA, Dashen Bank, Zemen Bank and Abay Bank) but not at CBO, Awash Bank, NIB, Hibret Bank, Oromia Bank. Card-less cash withdrawals, a more advanced feature, are accessible at selected banks, with differing availability depending on the bank.

Table 12: Services under ATM

No.	Services under ATM	List of Banks									
		CBE	CBO	BOA	NIB	Awash Bank	Dashen Bank	Zemen Bank	Hibret Bank	Oromia Bank	Abay Bank
1	Transfer of funds	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	Cash withdrawals	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	Check balance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4	Mobile Top Up	No	No	No	No	No	No	No	No	No	No
5	Print balance statement	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	Bill payments	No	No	No	No	No	No	No	No	No	No
7	Depositing cash	No	No	No	No	No	No	No	No	No	No
8	Card-less cash withdrawals	Yes	No	Yes	No	No	Yes	Yes	Yes	No	Yes

Source: Survey result (2023)

4.5.13 Type of cards provided by banks

All banks listed under Table 13, including CBE, CBO, BOA, NIB, Awash Bank, Dashen Bank, Zemen Bank, Hibret Bank, Oromia Bank, and Abay Bank, offer debit cards. This demonstrates a strong commitment to providing customers with a widely accepted and convenient payment option. Prepaid cards are available at seven banks, including CBE, BOA, NIB, Awash Bank, Zemen Bank, Hibret Bank, and Abay Bank but not in CBO, Dashen Bank and Oromia bank. However, when it comes to credit card only provided by Awash Bank. Addition to this, virtual

card, none of the ten banks in the list currently offer this service. This could be due to the different risk profiles and regulatory requirements associated with credit cards compared to debit cards.

Table 13: Type of cards provided by banks

No.	Type of cards provided	CBE	CBO	BOA	NIB	Awash Bank	Dashen Bank	Zemen Bank	Hibret Bank	Oromia Bank	Abay Bank
1	Debit card	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	Credit card	No	No	No	No	Yes	No	No	No	No	No
3	prepaid card	Yes	No	Yes	Yes	Yes	No	Yes	Yes	No	Yes
4	Virtual card	No	No	No	No	No	No	No	No	No	No

Source: Survey result (2023)

4.5.14 Services under Mobile banking

The provided table 14 outlines the availability of various services under mobile banking for different banks. The services listed include Check Balance, View Account, Pay Bills, Bank to bank transfer, Account to account transfer, Exchange Rates, ATM card management, Standing Orders, Cheque services, Mobile Top Up, Mini Statement, Utilities payment, Pay and manage beneficiary, and Check branch/ATM locations. All listed banks (CBE, CBO, BOA, NIB, Awash Bank, Dashen Bank, Zemen Bank, Hibret Bank, Oromia Bank, and Abay Bank) offer the service of checking account balance, View Account, Mobile Top Up, Account to account transfer and pay bills through mobile banking.

Bank to bank transfer: Bank to bank transfers through mobile banking are available at eight banks (CBE, CBO, BOA, Dashen Bank, Zemen Bank, Awash Bank and Hibret Bank), but not Oromia Bank and NIB is used bank to bank transfer in their services. This service allows customers to transfer funds between accounts held at different banks using their mobile devices and makes customers participate in innovation.

ATM card management: ATM card management services, such as activating, deactivating, or blocking ATM cards through mobile banking, are offered by three banks BOA, Zemen Bank, and Abay Bank. However, this service is not available at other banks like, CBE, CBO, NIB, Awash Bank, Dashen Bank, Hibret Bank and Oromia Bank.

Standing Orders: Only two of banks (BOA and Abay Bank) offer standing orders, which allow customers to set up recurring payments through mobile banking, automating regular bill payments or transfers.

Cheque services: Cheque services are limited to Hibret Bank, Oromia Bank, and Abay Bank. Customers of these banks can manage cheque-related activities through mobile banking.

Table 14: Services under Mobile banking

No.	Services under Mobile banking	List of Banks									
		CBE	CBO	BOA	NIB	Awash Bank	Dashen Bank	Zemen Bank	Hibret Bank	Oromia Bank	Abay Bank
1	Check Balance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	View Account	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	Pay Bills	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4	Bank to bank transfer	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes
5	Account to account transfer	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	Exchange Rates	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
7	ATM card management	No	No	Yes	No	No	No	Yes	No	No	Yes
8	Standing Orders	No	No	Yes	No	No	No	No	No	No	Yes
9	Cheque services	No	No	No	No	No	No	No	Yes	Yes	Yes
10	Mobile Top Up	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11	Mini Statement	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes	Yes
12	Utilities payment	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes
13	Pay and manage beneficiary	Yes	No	Yes	Yes	Yes	No	No	No	No	Yes
14	Check branch/ATM locations	No	No	Yes	Yes	No	No	Yes	No	No	No

Source: Survey result (2023)

Mini Statement: Except NIB and Awash Bank other eight banks offer mini statements, allowing customers to view brief transaction histories through mobile banking.

Utilities payment: Utilities payment services through mobile banking are provided by eight banks (CBE, CBO, BOA, Awash Bank, Dashen Bank, Hibret Bank, Zemen Bank and Abay Bank). Except NIB and Awash Bank.

Pay and manage beneficiary: This service is available at five banks, namely: CBE, BOA, NIB and Awash Bank and Abay Banks, enabling customers to make payments and manage beneficiaries through mobile banking.

Check branch/ATM locations: The feature to check branch and ATM locations is supported by BOA, NIB and Zemen Bank, but it is not available at other seven banks (CBE, CBO, Awash Bank, Dashen Bank, Hibret Bank, Oromia Bank, and Abay Bank) in the list.

4.5.15 Adoption of Virtual banking/ ITM

The given table 15 data presented a list of banks and their deployment status of Interactive Teller Machines (ITMs). Out of the ten banks mentioned, only one, Bank of Abyssinia (BOA), has deployed ITMs, on the other hand, the remaining nine banks, including CBE, CBO, NIB, Awash Bank, Dashen Bank, Zemen Bank, Hibret Bank, Oromia Bank, and Abay Bank, have not deployed ITMs as per the below table data.

Table 15: Deployed Virtual banking/ ITM

No.	Bank Name	Deployed Virtual banking/ ITM
1	CBE	No
2	CBO	No
3	BOA	Yes
4	NIB	No
5	Awash Bank	No
6	Dashen Bank	No
7	Zemen Bank	No
8	Hibret Bank	No
9	Oromia Bank	No
10	Abay Bank	No

Source: Survey result (2023)

4.5.16 Services under POS machine

Table 16 shows the services offered by different banks through Point of Sale (POS) machines. Among the listed banks, all of them (CBE, CBO, BOA, NIB, Awash Bank, Dashen Bank, Zemen Bank, Hibret Bank, Oromia Bank, and Abay Bank) offer three fundamental services on their POS machines: Balance inquiry, Receipt printer and Transfer account to account.

However, the data does not show any of the banks offering the following services on their POS machines: Cash withdrawal, Cash deposit, Airtime Top-up, and Bill payments. The absence of these services suggests that the banks have not integrated these specific functionalities into their

POS systems, or they might be using alternative channels to provide these services to their customers.

Table 16: Services under POS machine

No.	Services under POS machine	List of Banks									
		CBE	CBO	BOA	NIB	Awash Bank	Dashen Bank	Zemen Bank	Hibret Bank	Oromia Bank	Abay Bank
1	Cash withdrawal	No	No	No	No	No	No	No	No	No	No
2	Cash deposit	No	No	No	No	No	No	No	No	No	No
3	Airtime Top-up	No	No	No	No	No	No	No	No	No	No
4	Bill payments	No	No	No	No	No	No	No	No	No	No
5	Balance inquiry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	Transfer account to account	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7	Receipt printer	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: Survey result (2023)

4.5.17 Adoption of POS agent

The provided in above table 17 lists various banks and indicates whether they have Point of Sale (POS) agent services available. According to the data, none of the listed banks, including CBE, CBO, BOA, NIB, Awash Bank, Dashen Bank, Zemen Bank, Hibret Bank, Oromia Bank, and Abay Bank.

Table 17: Adoption of POS agent

No.	Bank Name	Adopted POS agent
1	CBE	No
2	CBO	No
3	BOA	No
4	NIB	No
5	Awash Bank	No
6	Dashen Bank	No
7	Zemen Bank	No
8	Hibret Bank	No
9	Oromia Bank	No
10	Abay Bank	No

Source: Survey result (2023)

4.5.18 Adoption of POS merchant

The data provided presents a list of banks and their status regarding the availability of Point of Sale (POS) merchant services under Table 28. According to the data, all of the listed banks, including CBE, CBO, BOA, NIB, Awash Bank, Dashen Bank, Zemen Bank, Hibret Bank, Oromia Bank, and Abay Bank, offer POS merchant services.

Table 18: Adoption of POS merchant

No.	Bank Name	Adopted POS merchant
1	CBE	Yes
2	CBO	Yes
3	BOA	Yes
4	NIB	Yes
5	Awash Bank	Yes
6	Dashen Bank	Yes
7	Zemen Bank	Yes
8	Hibret Bank	Yes
9	Oromia Bank	Yes
10	Abay Bank	Yes

Source: Survey result (2023)

4.5.19 Services under POS merchant

Table 19: Services under POS merchant

No.	Services under POS merchant	List of Banks									
		CBE	CBO	BOA	NIB	Awash Bank	Dashen Bank	Zemen Bank	Hibret Bank	Oromia Bank	Abay Bank
1	Cash withdrawal	No	No	No	No	No	No	No	No	No	No
2	Cash deposit	No	No	No	No	No	No	No	No	No	No
3	Airtime top-up	No	No	No	No	No	No	No	No	No	No
4	Bill payments	No	No	No	No	No	No	No	No	No	No
5	Balance inquiry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	Transfer account to account	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7	Receipt printer	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: Survey result (2023)

As shown under Table 19, the data gives the services offered by different banks through their Point of Sale (POS) merchant facilities. Among the listed banks, all of them, including CBE, CBO, BOA, NIB, Awash Bank, Dashen Bank, Zemen Bank, Hibret Bank, Oromia Bank, and Abay Bank, offer Balance inquiry, Transfer account to account, and Receipt printer services on their POS machines. However, the data shows that none of the banks offer services such as Cash withdrawal, Cash deposit, Airtime Top-up, or Bill payments through their POS merchant facilities.

4.5.20 Services under Mobile Money

Table 20 Services under Mobile Money

No.	Services under mobile money	List of Banks									
		CBE	CBO	BOA	NIB	Awash Bank	Dashen Bank	Zemen Bank	Hibret Bank	Oromia Bank	Abay Bank
1	Fund transfer to account	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	Fund transfer wallet to wallet	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	Bill Payment	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4	Pay at merchant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	Wallet account information	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	Cash withdrawal from agent	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7	Cash deposit to agent	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8	Airtime top-up	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Source: Survey result (2023)

According Table 20 data, the table provides the services offered by different banks through Mobile Money platforms. Among the listed banks, all of them, including CBE, CBO, BOA, NIB, Awash Bank, Dashen Bank, Zemen Bank, Hibret Bank, Oromia Bank, and Abay Bank, offer a comprehensive range of Mobile Money services. Those are: Fund Transfer to account, Fund Transfer wallet to wallet, Bill Payment, Pay at merchant, Wallet account information, Cash withdrawal from agent, Cash deposit to agent and Airtime top-up.

4.5.21 Services under Agency banking

Table 21 shows the Agency Banking services offered by nine banks except Zemen Bank, including CBE, CBO, BOA, NIB, Awash Bank, Dashen Bank, Hibret Bank, Oromia Bank, and Abay Bank. Those service are: Opening E-Wallet Account, Airtime Top-up, Merchant's Services, Balance Inquiries, Cash Deposits, Cash Withdrawals, Bill Payments, P2P Transfer, Utility Bills, Mini Statement.

Table 21: Services under Agency banking

No.	Services under Agency banking	List of Banks										
		CBE	CBO	BOA	NIB	Awash Bank	Dashen Bank	Zemen Bank	Hibret Bank	Oromia Bank	Abay Bank	
1	Opening E-Wallet Account	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	
2	Airtime Top-up	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	
3	Merchant's services	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	
4	Balance inquiries	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	
5	Cash deposits	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	
6	Cash withdrawals	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	
7	Bill payments	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	
8	P2P transfer	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	
9	Utility bills	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	
10	Mini Statement	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	

Source: Survey result (2023)

4.6 Adopted Mobile based digital loan

Table 22: Adopted Mobile based digital loan

NO.	Banks that adopted mobile based digital loan	Platform name
1	Bank of Abyssinia	Apollo Abyssinia Bank
2	Cooperative Bank of Oromia	Michu
3	Dashen Bank	Dube Ale
4	CBE and Dashen Bank jointly with Ethio Telecom	Telebirr based

Source: Survey result (2023) and Ethio telecom website

4.6.1 Apollo Abyssinia Bank

Apollo Abyssinia Bank is leading a groundbreaking transformation in the Ethiopian banking sector by introducing a pioneering digital banking platform launched on Jan,2023. This innovative approach removes the physical barriers that many customers face when opening, accessing, and managing bank accounts. Apollo's digital banking platform offers a suite of valuable features and benefits. Users can now open and manage bank accounts online, representing a significant shift towards digital banking services, thereby enhancing accessibility and convenience. Additionally, Apollo streamlines fund transfers, allowing customers to instantly move money between accounts using EthSwitch and RTGS, simplifying financial transactions.

The platform also supports seamless payments for services like DSTV and includes an integrated Visa payment feature, eliminating the need for physical payment cards. A unique aspect of Apollo is its ability to schedule payments, even in remote areas without an internet connection, providing users with flexibility in managing their finances.

Furthermore, Apollo offers an attractive 9% savings account interest rate, encouraging savings and financial growth. Lastly, the platform extends its services to loans, including personal loans and advances on salaries, with eligibility determined by transaction history, prior payments, and real-time employment status assessments. Overall, Apollo's comprehensive approach aims to modernize and enhance the banking experience for Ethiopian customers, making it more accessible, convenient, and rewarding.

4.6.2 Michu Digital Lending Platform

Michu, Introduced by Cooperative Bank of Oromia with collaboration Kifiya Financial in January 2022, signifies a noteworthy achievement as Ethiopia's inaugural unsecured digital lending offering, introduced in partnership with the Cooperative Bank of Oromia. Tailored for micro, small, and medium-sized enterprises (MSMEs), Michu employs state-of-the-art technology to present an innovative digital lending solution. It relies on an AI-driven credit scoring system to provide individuals and businesses with convenient access to credit. Michu positions itself as a secure, swift, and digitally streamlined method for applying for loans, with an emphasis on a straightforward repayment process.

Product Offerings:

Michu Wabii Loan: This product offers a credit limit ranging from 50,000 to 100,000 Ethiopian Birr, with a credit period of 30 days. Users are charged an access fee of 2% and an interest rate of 8%. A penalty fee of 5% per month is applicable in case of delays in repayment.

Michu Guyya Loan: With a credit limit spanning from 2,000 to 15,000 Ethiopian Birr, this product features a shorter credit period of 7 days. The access fee for this loan is 12%, and a penalty of 5% per week is imposed in cases of delayed repayment.

Michu's introduction represents a significant step forward in providing accessible and innovative financial solutions for MSMEs in Ethiopia. By combining advanced technology, AI-driven credit assessment, and user-friendly features, Michu aims to address the financial needs of this important segment of the economy while ensuring a secure and efficient borrowing experience.

4.6.3 Dube Ale platform

Dashen Bank, in partnership with EagleLion System Technology, has introduced "Dube Ale," an innovative Buy-Now Pay Later program, revolutionizing Ethiopia's traditional deferred payment system known as "dube.". This cutting-edge scheme empowers users to make credit-based purchases, offering the flexibility of paying back in increments over three months, six months, or a year.

Dashen Bank envisions that Dube Ale will invigorate economic activity by granting consumers the freedom to acquire essential products and services without the burden of immediate upfront payment. To access this service, customers can easily download the user-friendly Dube Ale application from either the Play Store or App Store, complete the registration process, and then visit a nearby Dashen Bank branch to establish a customized spending limit. Eligibility for this convenient service necessitates individuals to be of legal age (above 18) and possess a verifiable monthly income, substantiated by documents such as employer-issued letters or, in the case of business owners, valid business licenses. Also, the maximum spending limit on Dube Ale is currently set at 700,000 Birr and is determined at Dashen Bank branches. Payments can only be made using the app, and withdrawals are not allowed.

4.6.4 Telebirr based loan with CBE and Dashen Bank

Commercial Bank of Ethiopia, Dashen Bank and Ethio telecom, as key enablers of comprehensive development and growth in the nation, have officially launched digital micro-credit and micro-saving services through telebirr. These services offer fast, easy, and secure alternative financial solutions, increasing the outreach of banking and financial services while bridging the financial inclusion gap nationwide.

The micro-credit and micro-saving services, launched under the principle of "Financial Service for All," are accessible on a non-collateral platform for individual customers, merchants, and agents. Eligibility is determined based on their telebirr transaction credit score and salary payments via telebirr.

The four digital financial services introduced by CBE jointly with Telebirr are as: Sinq: This service offers interest-free or interest-based micro-saving options, allowing Telebirr customers to securely save money, both in ordinary and locked accounts. Enderas: Individual telebirr customers can access micro-credit services of up to 15,000 ETB based on their telebirr transactions and service usage.

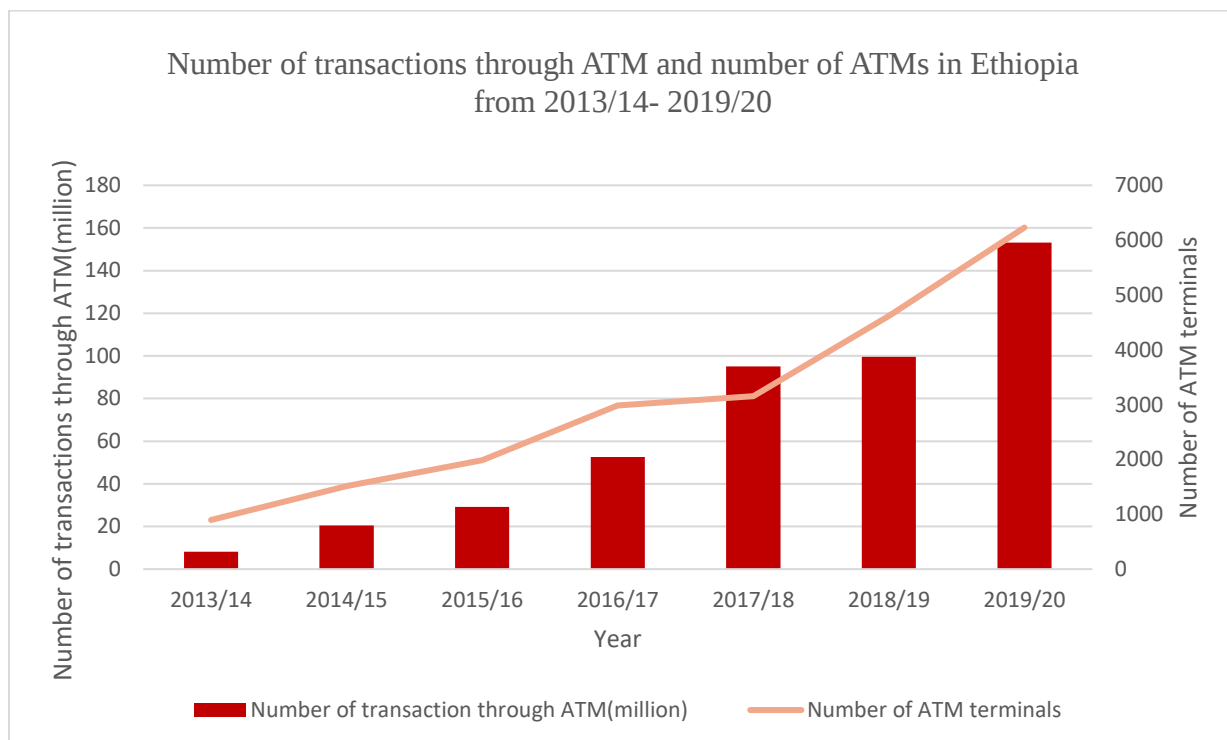
Deldiy: Merchants and agents can borrow up to 50,000 ETB through this micro-credit service to initiate or expand their businesses. Adrash: Designed for employees of private and public institutions receiving their monthly salaries via telebirr, this credit service enables them to borrow up to 50,000 ETB. In partnership with Dashen Bank, three types of financial services are offered: telebirr mela (micro-credit), telebirr Endekise (credit pay/overdraft service), and telebirr sanduq (micro-saving service). These services are easily accessible through the telebirr App and USSD (*127#), providing customers with convenient and inclusive financial solutions tailored to their needs. This initiative aligns with Ethiopia's commitment to enhancing financial inclusion and fostering economic growth. These digital financial services, jointly launched by both institutions, are particularly noteworthy because they allow customers in both rural and urban areas to access loans without the need for collateral.

Moreover, customers' eligibility is influenced by factors such as being an Ethio telecom and telebirr customer, transaction frequencies, and credit scores calculated by an artificial intelligence

system. Responsible loan repayment and increased transaction activity enable customers to maximize their credit scores and borrowing capacity.

4.7 Integration of ATM and POS machine through different Ethiopia's banks based on number of transaction and number of ATM and POS machine

Figure 2: Number of transactions through ATM and number of ATMs in Ethiopia from 2013/14-2019/20.



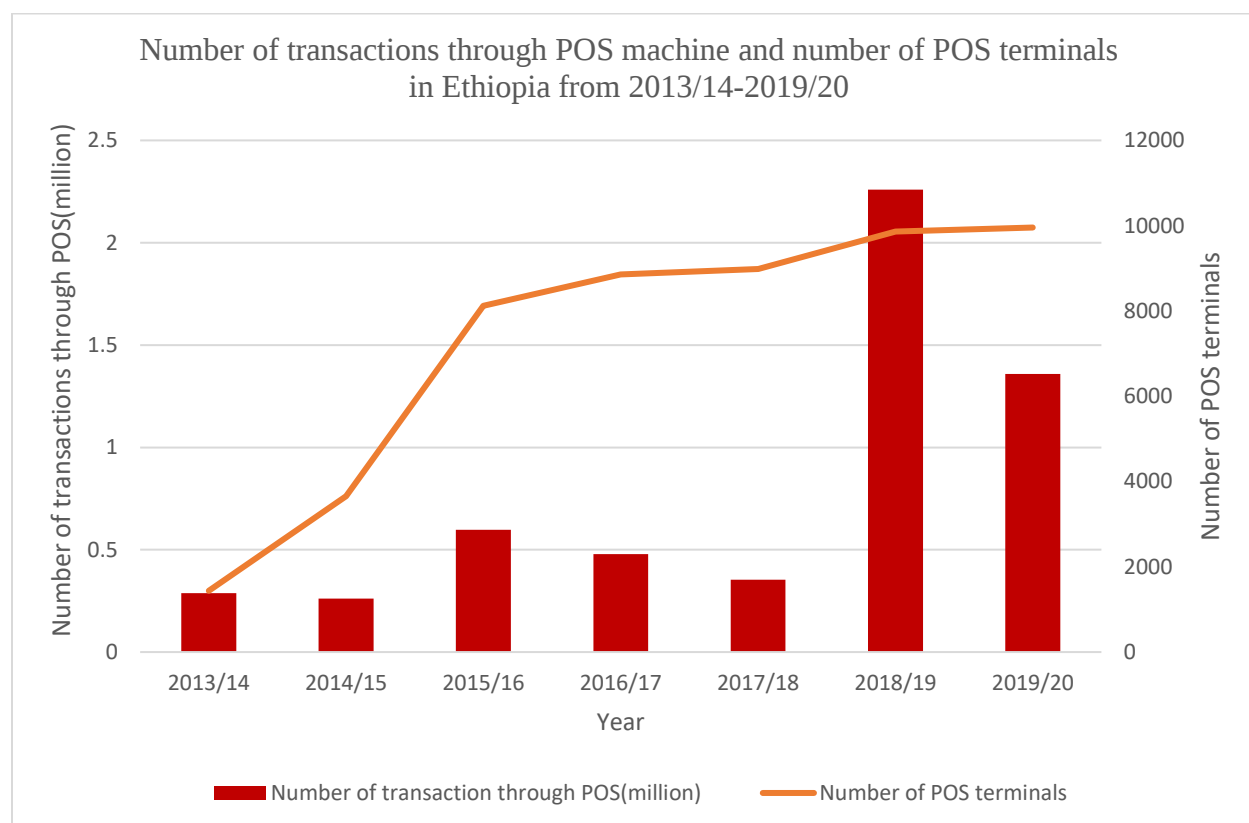
Sources: NBE annual reports (in different year).

In Ethiopia the technical compatibility that enables a payment system to be used in conjunction with other payment systems is done via EthSwitch controlled system for real-time gross settlement (RTGS), ATM and POS transaction by using one debit card or International credit cards on different ATM and POS machine.

Interconnection protocol for POS machine is facilitated by EthSwitch, to authenticate, authorize, and clear payments from banks. It also allows cardholders to make payments at any location using the POS terminal of any bank (Wondewossen, 2022). Integration of ATMs has been in place since 2016, but only for withdrawals, as interbank transfers are not allowed on ATM machine, indicating the absence of interconnectivity at the platform level. Following the launching of interconnectivity

for withdrawal transactions, the number of transactions and amount through ATMs increased significantly (see figure 2 and figure 3).

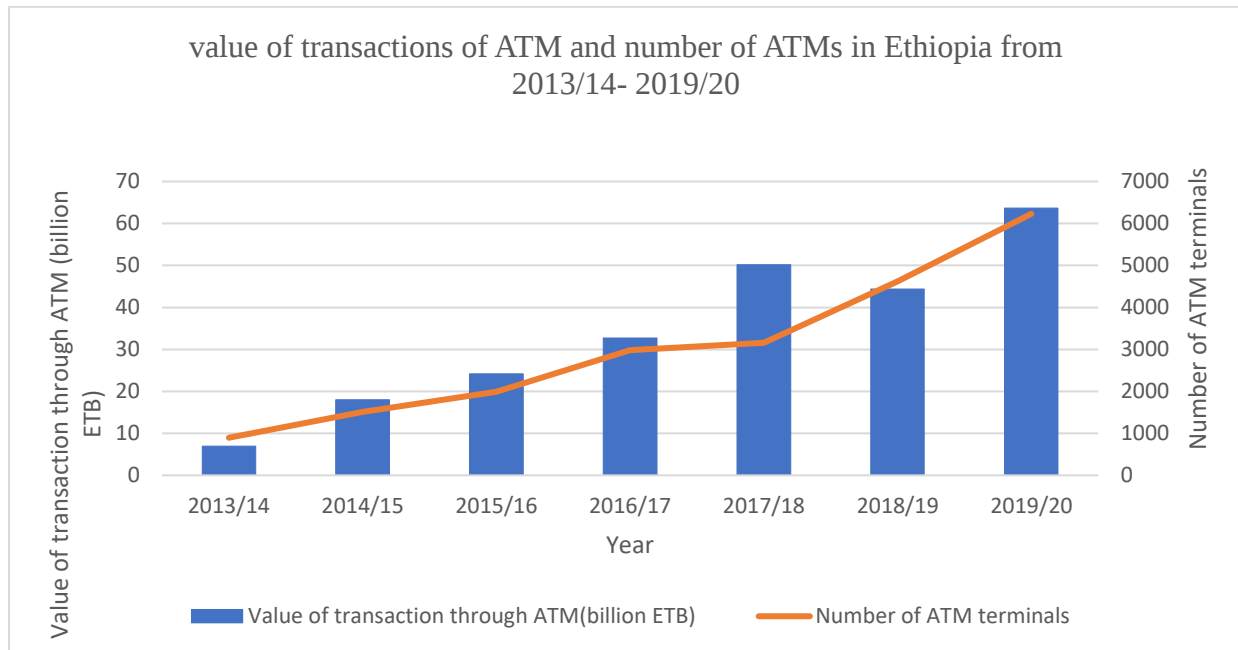
Figure 3: Number of transactions through POS machine and number of POS terminals in Ethiopia from 2013/14-2019/20.



Sources: NBE annual reports (In different year).

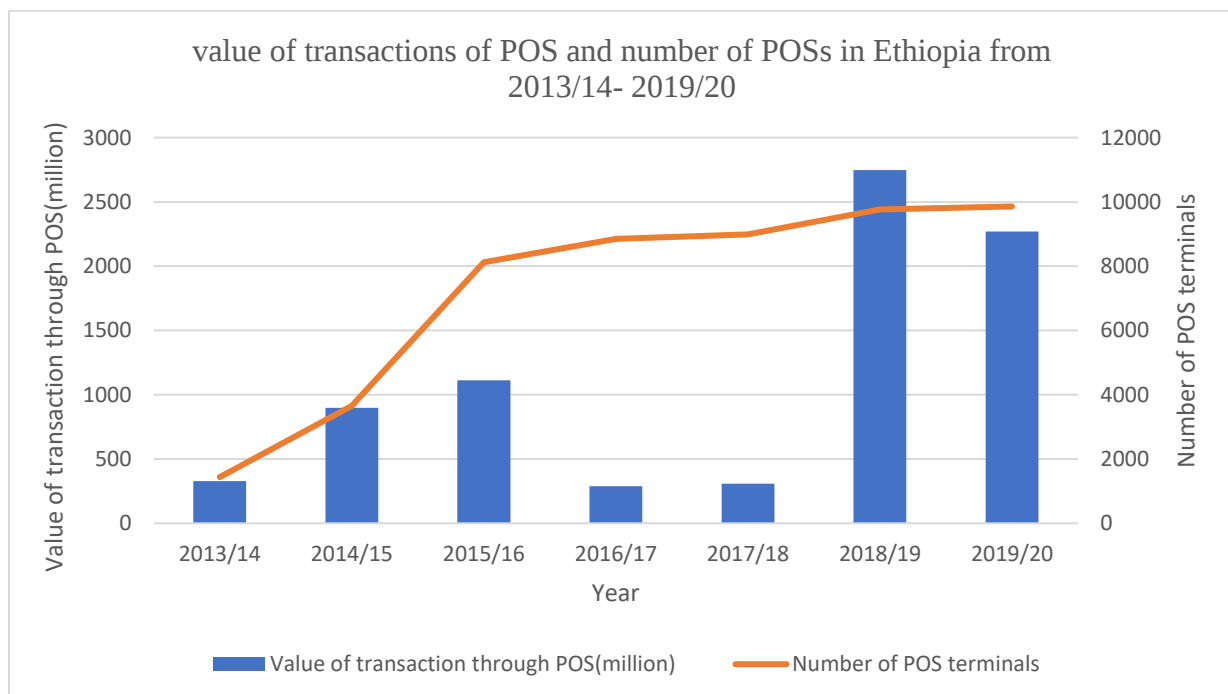
During the period spanning from 2016/17 to 2019/20, there was an annual growth of approximately 30.7 percent in the number of transactions. This implies that the partial interoperability of ATMs might have played a role in the notable increase in transaction volumes. Figure 5 illustrates the amount of these transactions in actual terms, revealing a rising trend over time. In September 2020, EthSwitch introduced interoperability for Point of Sale (POS) operations (Wondewossen, 2022). Utilizing the interconnection protocol facilitated by EthSwitch, this POS interoperability allows terminals to authenticate, authorize, and process payments from various banks. Moreover, it permits cardholders to execute transactions at any location using the POS terminal of any bank. It is worth noting that the volume of transactions through POS remained relatively low, especially during the period from 2013/14 to 2017/18, experiencing a slight increase in 2018/19 and 2019/20, as depicted in Figure 5.

Figure 4: Real value of transactions of ATM and number of ATMs in Ethiopia from 2013/14-2019/20



Sources: NBE annual reports (in different year).

Figure 5: Real value of transactions of POS and number of POSs in Ethiopia from 2013/14-2019/20



Sources: NBE annual reports (in different year).

4.8 Factor influencing technology adoption in Ethiopia bank

The digital transformation of the Ethiopian banking sector is influenced by a combination of factors, some of which present significant challenges. As, data gathered from survey using interview, respondents from ten banks reveals that factor is the issue of power, network failures that happens on ongoing transaction, high cost of commission on using digital services like ATM, POS and RTGS transfer are the major reason that digital product user face difficulties that handers tech. Ethiopia, like many African countries, faces power shortages and inconsistent electricity supply. This unreliable power infrastructure can disrupt digital banking operations, affecting customer transactions and service availability. To fully harness the benefits of digital banking, addressing these power challenges and investing in reliable backup systems is essential.

Network failures during ongoing transactions are another critical challenge. In a digital banking environment, uninterrupted network connectivity is vital for the seamless execution of financial transactions. Ethiopia has experienced network outages that can disrupt customer interactions with digital banking platforms, causing inconvenience and potentially leading to financial losses. Ensuring robust and resilient network infrastructure is crucial to mitigate these interruptions and enhance the reliability of digital banking services.

Moreover, the high cost of commissions associated with using digital services like ATMs, POS, and RTGS transfers can deter customers from adopting these convenient channels. Affordability is a significant consideration for many Ethiopians, and if the fees for digital services are perceived as prohibitively high, it can hinder the widespread adoption of digital banking. Banks should carefully evaluate their fee structures and consider more competitive pricing models to make digital banking accessible to a broader segment of the population.

Additionally, there is room for improvement in enhancing staff willingness to provide awareness about digital products and usage. Employees play a crucial role in educating customers about the benefits and functionalities of digital banking. Banks should invest in training and incentivizing their staff to promote digital services actively, helping customers overcome any reservations or uncertainties they may have about using these platforms. According table 23, data reveals that Ethiopia's infrastructure have low infrastructure with ICT and electric access that makes Ethiopia's bank face challenges to transfer financial based digital technology products and services for their customers. The score reflects certain challenges Ethiopia faces in building a robust and

efficient infrastructure system that affect banks negatively by making hard to transfer technologies in the country. Additionally, Information and Communication Technologies (ICTs) score 34.2, ranking Ethiopia 124th globally.

ICT access is a particular area of weakness, with a score of 36.8 and a ranking of 130th. This suggests that many Ethiopians may not have widespread access to digital and telecommunications services like; digital products and services provided by banks, potentially limiting their participation in technology transfer in financial sector specifically in bank. However, general infrastructure, which includes aspects beyond ICT, scores 23.5 and ranks Ethiopia 86th. This suggests that while the broader infrastructure framework has room for improvement. One notable aspect is the electricity output, measured at 134.9 GWh per million population, ranking Ethiopia 122nd. This may indicate that Ethiopia's efforts to improve its energy infrastructure for technology advancement for banks.

In conclusion, Ethiopia banking sector faces challenges in its infrastructure and ICT sectors, particularly in terms of ICT and electric access. Addressing these challenges is crucial for Ethiopia's continued financial using technology based financial services.

Table 23: Ethiopian Infrastructure rank (auto 132 countries).

	Score	Rank
Infrastructure	23.9	123
Information and communication technologies (ICTS)	34.2	124
ICT access	36.8	130
ICT use	30.0	113
General infrastructure	23.5	86
Electricity output, GWh /mn pop.	134.9	122

Source: Own computation based on WIPO (2022) database.

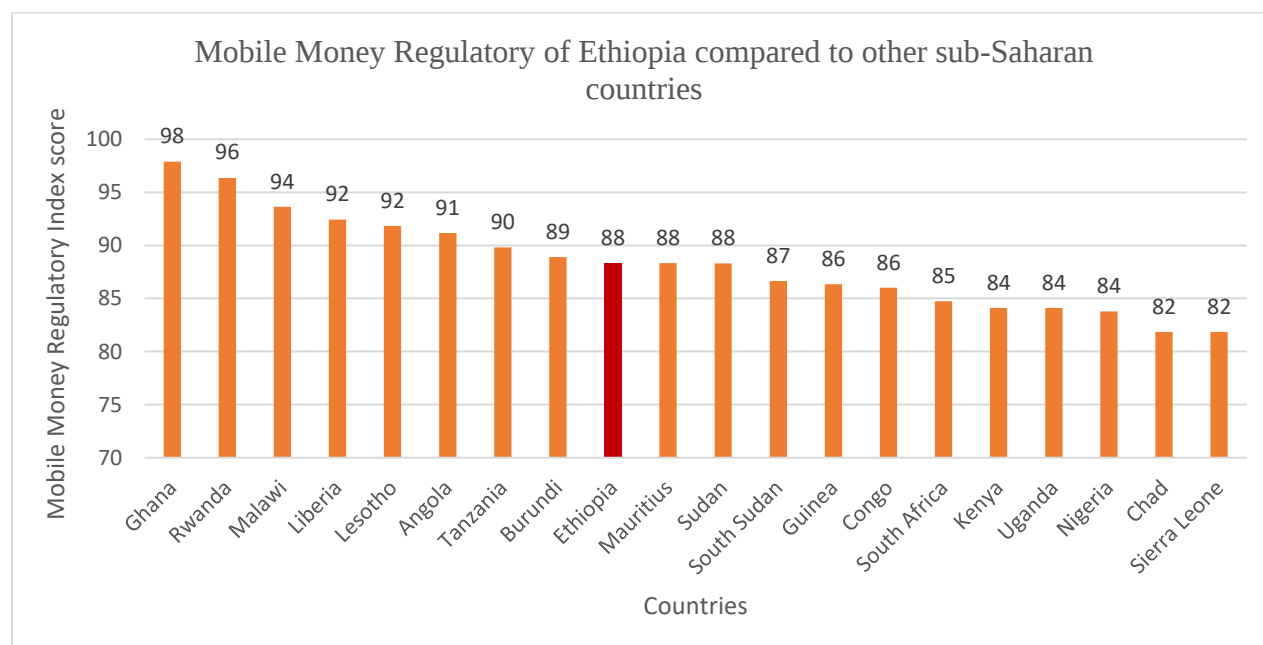
4.9 Mobile Money Regulatory of Ethiopia compared to other sub-Saharan countries

Recognizing the potential of mobile money to bring unbanked populations into the formal financial sector is the best channel of digital banking products and services in Ethiopia. The successful implementation of mobile money services requires a robust telecommunications infrastructure to make customer adopt easily. Improving connectivity in rural areas and addressing infrastructure challenges may be a part of the regulatory considerations. Ethiopia's score of 88 is a notable

achievement, highlighting the country's understanding of the significance of mobile money in advancing financial inclusion and economic development. While Ethiopia's score is slightly lower than some neighboring East African countries like Kenya and Rwanda, it's important to consider the variations in regulatory environments driven by different economic conditions and policy priorities. The Payment Instrument Issuers Directive (NBE. (2020), Directive on the Licensing and Authorization of Payment Instrument Issuers No. ONPS/01/2020) and Use of Agents Directive (NBE. (2020), Directive on the Use of Agents No. FIS/02/2020) in 2020 have helped to accelerate the development of the mobile money ecosystem and created a more enabling environment for financial inclusion via mobile money for Ethiopia. These regulatory reforms have boosted Ethiopia's score from 80 to 88 between 2019 and 2021, with the country ranking ninth in Sub-Saharan Africa countries (see figure 6).

Many African countries have made substantial progress, achieving scores above 50 based on below figure 6, indicating a positive regulatory environment for mobile money. This reflects the region's collective recognition of the pivotal role mobile money plays in expanding access to financial services. However, challenges persist in creating regulatory frameworks that balance innovation and consumer protection.

Figure 6: Mobile Money Regulatory of Ethiopia compared to other sub-Saharan countries

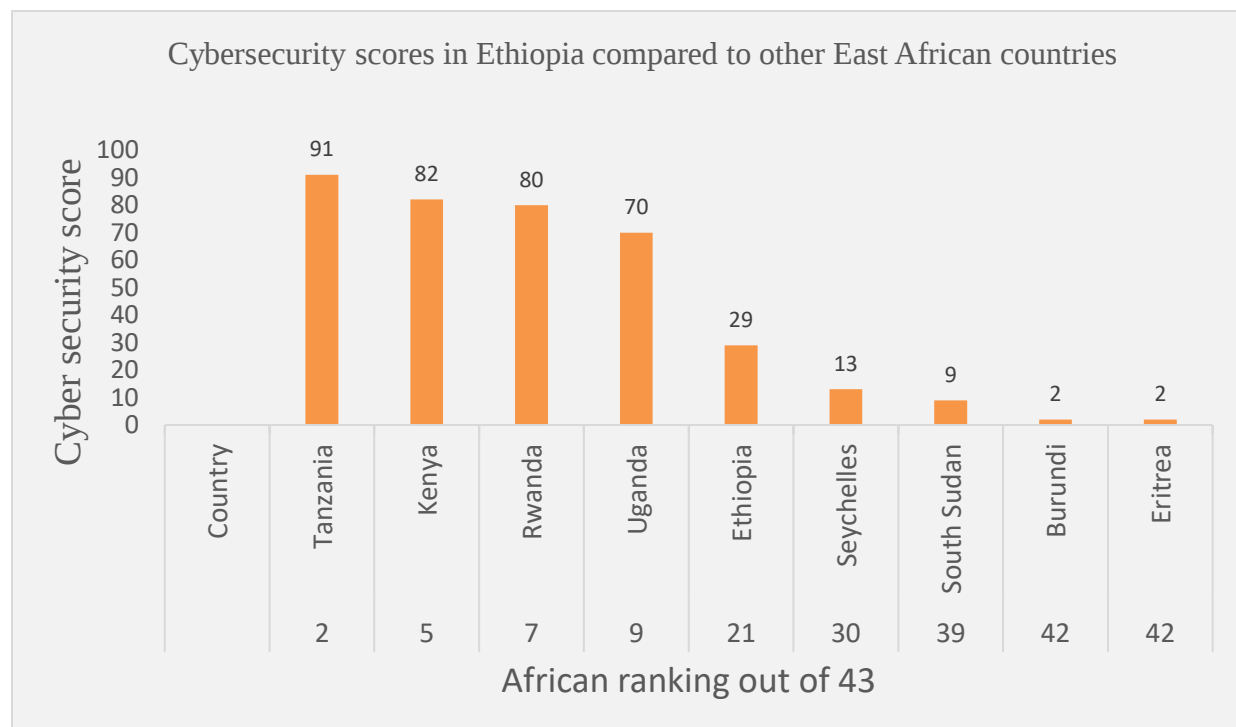


Source: Own computation based on GSMA (2022) database.

4.10 Cybersecurity of Ethiopia compared to other East African countries

According to data gathered from survey using interview, respondents from ten banks reveals that additional to issues of power and network failures that affecting digital transformation is the issue of security that makes customers hold them to adopt digital banking products and services. According to the International Telecommunication Union (ITU), Ethiopia lags behind its neighbors in cybersecurity (Figure 7). Clearer cybersecurity frameworks and strategies to protect the digital financial system could give Ethiopian mobile money users more confidence in mobile money services and lead to higher adoption. By combining a strong cybersecurity framework with cutting-edge technologies, Ethiopian mobile money users can experience a secure and technologically advanced digital banking environment. This, in turn, can lead to increased confidence, higher adoption rates, and a thriving digital financial ecosystem.

Figure 7: Cybersecurity scores in Ethiopia compared to other East African countries



Source: Own computation based on ITU (2022) database.

Ethiopia, with a score of 27.74, occupies the 21st position in the African ranking. While the score indicates room for improvement, it's essential to consider Ethiopia's unique circumstances and ongoing efforts to strengthen its cybersecurity framework. Especially, as it more advantageous to

expand its digital infrastructure for digital banking users to adopt easily without any fear of that may happen in terms of lack of security.

These scores suggest a need for substantial investment and capacity-building in cybersecurity to protect digital assets and data of customer in financial service providers, includes banks.

4.11 Innovation index of technology in subsaharan countries

The key determinants of innovation are the infrastructure access, R&D, and human capital among others (Qureshi et.al., 2021). This infrastructure access includes electricity and telecommunication that needed for ICT enhancement. Country who has high infrastructure access will have high adoption rate of technology (Corrales et. al., 2006). Which includes; financial based technology like; mobile banking and mobile money in banking industries. Also, ICT investment, electricity access and mobile ownership are potential determinants of digital adoption (Kumar et. al., 2023)

Ethiopia is ranked 117th globally out of 132 countries, indicating its position in the lower half of the index. Within the Sub-Saharan African context, Ethiopia is ranked 14th (see table 28). This shows how Ethiopia lags behind other African countries by infrastructure access, R&D and mobile ownership (see table 24) which makes a country less adaptive for digital banking access.

While Ethiopia is making efforts to foster innovation and technological advancements, it faces challenges that impact its innovation. These challenges include limited access to technology and research resources, lower investment in research and development that affect indirectly digital transformation in banking industries. Despite Ethiopia's concerted efforts to foster innovation and technological advancements, it grapples with challenges that hinder its progress. Limited access to technology and research resources poses a significant barrier, restricting the nation's ability to keep pace with the rapidly evolving digital landscape.

Addressing these challenges is pivotal for Ethiopia to bridge the gap and create an environment conducive to digital innovation in the banking sector. Increased investments in infrastructure development, research and development initiatives, and strategies to enhance mobile ownership can propel Ethiopia towards a more adaptive and resilient digital banking landscape. Collaborative efforts between public and private sectors, along with international partnerships, can play a crucial role in overcoming these challenges and positioning Ethiopia as a frontrunner in digital innovation in the years to come.

Table 24: Innovation of technology in sub-Saharan countries

Innovation of technology in sub-Saharan countries		
Country	Rank at world level Out of 132 Country	Rank at Sub-Saharan country
Mauritius	45	1
South Africa	61	2
Botswana	86	3
Kenya	88	4
Ghana	95	5
Namibia	96	6
Senegal	99	7
Tanzania	103	8
Rwanda	105	9
Madagascar	106	10
Zimbabwe	107	11
Côte d'Ivoire	109	12
Nigeria	114	13
Ethiopia	117	14
Zambia	118	15
Uganda	119	16
Burkina Faso	120	17
Cameroon	121	18
Togo	122	19
Mozambique	123	20
Benin	124	21
Niger	125	22
Mali	126	23
Angola	127	24
Mauritania	129	25
Burundi	130	26
Guinea	132	27

Source: World Intellectual Property Organization (2022)

4.12 Number of Financial agents in Ethiopia compared to other Sub-Saharan African markets

The data on the number of financial agents per 100,000 adults in Ethiopia and other Sub-Saharan African countries reveals a significant disparity in the accessibility of financial services through agent networks. In 2020, Ethiopia had a significantly lower number of financial agents, with only

77 agents per 100,000 adults. This indicates a considerable gap in financial service accessibility, particularly in remote and rural areas.

Table 25: Number of financial agents in Ethiopia compared to other Sub-Saharan African markets (per 100,000 adults)

Country	Number of Agents per 100,000 adults	Year
Ghana	2,135	2018
Rwanda	1,144	2019
Uganda	943	2019
Kenya	701	2019
Ethiopia	77	2020

Source: Own computation based on IMF Financial Access Survey and NBE.

The available data underscores the significant hurdles that Ethiopia encounters in achieving widespread financial inclusion and improving access to banking services, particularly through agent networks. The strikingly low number of agents per capita in Ethiopia signals a substantial gap in the reach of essential financial services.

This limitation is particularly pronounced in rural and remote areas, where the scarcity of banking agents exacerbates challenges related to economic development and financial well-being. Without a robust network of agents, individuals in these underserved regions face impediments in conducting basic financial transactions, limiting their ability to save, invest, and participate fully in the formal financial system.

The dearth of accessible banking services through agent networks not only impedes individual economic empowerment but also hampers broader national development goals. Financial inclusion is intricately linked to poverty reduction and economic growth, and the shortage of banking agents in Ethiopia represents a critical bottleneck in achieving these objectives.

Addressing this challenge requires strategic interventions, such as the expansion of agent networks, particularly in rural areas, and the promotion of digital financial literacy to encourage the use of available services. By addressing the agent network deficit, Ethiopia can make significant strides towards fostering financial inclusion, empowering its citizens, and driving inclusive economic development across the country.

4.13 Mobile phone ownership in Ethiopia compared to other Sub-Saharan African countries

Mobile ownership, a prerequisite for mobile money adoption, is relatively low in Ethiopia, especially among women. In table below 76% of men compared to 55% of women, reported owning a mobile phone. Overall, mobile ownership in Ethiopia is lower than in other Sub-Saharan African countries (see table 26).

Table 26: Mobile phone ownership in Ethiopia compared to other Sub-Saharan African countries (Percentage of total adult population)

Country	Male	Female
Ethiopia	76%	55%
Ghana	92%	86%
Kenya	93%	88%
Nigeria	91%	86%

Source: Own computation based on GSMA (2022) data.

By comparing mobile phone ownership in Ethiopia to other Sub-Saharan African countries reveals a significant disparity in mobile phone access, particularly among different genders. In Ethiopia, mobile phone ownership is relatively low, with 76% of men which uses basic, feature and smart phone is 30%, 17%, 22% respectively. And 55% of women reporting that they own a mobile phone from this 24%, 10% and 12% of women use basic, feature and smart phone respectively. This indicates that mobile phone penetration and usage in Ethiopia is not as widespread as it is in some other Sub-Saharan African countries. Kenya has been at the forefront of mobile technology adoption in Africa, with widespread access to mobile phones and mobile money services. Similarly, Nigeria also records substantial mobile phone ownership, with 91% of men and 86% of women owning mobile phones. Nigeria's large population contributes to a sizable mobile phone user base.

The existence of a significant gender disparity in mobile phone ownership in Ethiopia can have implications for financial inclusion and participation in the digital economy. Additionally, Ethiopia's overall mobile phone ownership rates are lower than those of its sub-Saharan African counterparts, highlighting the need for policies and initiatives aimed at increasing access to affordable mobile devices, especially in rural areas, to promote digital payment through different digital channels, including internet banking, mobile banking, and mobile money.

CHAPTER FIVE

Summaries of Findings, Conclusion and Recommendations

The study intended to assess the digital transformation of financial sector specifically in banking sector in the adoption of digital banking system in Ethiopia, through adopting mixed research approach. On the other hand, the purpose of this chapter is to outline the summary of findings in section, followed by conclusion and presents some recommendations forwarded

Summary of findings

First, the analysis of both the primary and secondary data reveals that the Ethiopian digital banking regulation has revealed several key findings.

- National Payment System Proclamation mandates commercial banks to issue standard terms and conditions for electronic fund transfers and stored-value cards. However, there's a lack of specific directives regarding these terms and conditions. Fraud handling in e-banking transactions is not adequately addressed in current regulations, leaving consumers exposed to potential financial losses.
- The current legal framework for ATMs is clear, listing services allowed on these machines. However, there is no explicit mention of virtual banking in existing directives. The introduction of virtual banking by one bank raises questions about the applicability of existing regulations to this innovative form of banking.

Second, after conducting a comprehensive analysis of the digital banking structure across various levels within the selected banks with their products and services they adopted, several key findings emerge:

- Nine out of ten banks have established dedicated digital departments at their head offices, highlighting the recognition of the need for centralized oversight of digital banking initiatives. Zemen Bank is the exception in this regard.
- Nine banks have established digital departments at the district level, while Zemen Bank does not have such a department, suggesting differences in digital infrastructure strategies among the banks.

- Only Awash Bank among the ten has dedicated Digital Banking Officers at the branch level, indicating variations in the banks' approach to digital banking management.
- Mastercard is widely supported among the banks, followed by Visa and Union Pay, but the extent of integration varies. Awash Bank stands out for integrating with multiple six card networks.
- Several Ethiopian banks, including Apollo Abyssinia Bank, Cooperative Bank of Oromia (Michu Digital Lending Platform), Dashen Bank (Dube Ale platform), and others, have introduced innovative digital loan and banking services. These services aim to enhance accessibility, convenience, and financial inclusion for customers.
- Factors affecting the adoption of digital banking technology in Ethiopia include power shortages, network failures during transactions, high commission costs for digital services, and challenges related to staff awareness and willingness to promote digital products.
- Ethiopia's Mobile Money Regulatory Index score of 88 indicates a positive regulatory environment for mobile money services. While slightly lower than some neighboring countries, it reflects Ethiopia's commitment to financial inclusion and digital financial services.
- Ethiopia lags behind its East African neighbors in terms of cybersecurity readiness. Clearer cybersecurity frameworks and strategies are needed to protect digital financial systems and boost consumer confidence in mobile money services.
- Ethiopia has a significantly lower number of financial agents per capita compared to other Sub-Saharan African countries, impacting financial inclusion, particularly in rural areas.
- Mobile phone ownership in Ethiopia is lower, especially among women, compared to other Sub-Saharan African countries. The gender gap in mobile ownership is significant and can affect access to digital financial services.

Conclusion

The regulatory framework for digital banking in Ethiopia is undergoing development, with several gaps and inconsistencies identified. While the legal framework sets the stage for digital banking, the absence of specific directives and regulations leaves room for ambiguities and inconsistencies, particularly in areas like fraud handling, pricing, and virtual banking. Additionally, the enforcement of existing directives, such as ATM reconciliation and refund of funds, appears to be lacking. To foster a robust digital banking ecosystem that safeguards consumers and promotes financial inclusion, there is a need for comprehensive and clear regulations and effective enforcement mechanisms.

The analysis of the digital banking structure within the selected banks reveals a widespread adoption of digital banking services and technologies. While there is a general alignment in terms of adopting core digital technologies, there are variations in the extent to which advanced features and services are implemented across banks. The study reveals a significant and widespread adoption of digital banking services among Ethiopian banks. These institutions recognize the importance of catering to modern customer needs by providing convenient and accessible digital solutions. However, there is variation in the extent and nature of digital services offered, with some banks offering more advanced features than others.

The presence of dedicated digital departments at both head office and district levels demonstrates a commitment to technology-driven transformation. Furthermore, the integration with card networks and the provision of Mobile Money and Agency Banking services highlight the banks' efforts to offer a comprehensive range of digital financial solutions.

Despite these positive findings, there are still areas where improvement is needed, such as the adoption of ITMs and the expansion of advanced Internet Banking services. Additionally, enhancing cybersecurity measures should remain a priority as digital services become more prevalent.

The country's digital banking sector is evolving, with various banks introducing innovative services, but addressing power issues and network interruptions is critical for improving usage of digital banking channels.

Recommendations

Based on the Ethiopian digital banking regulation the following measures of actions are provided as recommendations:

- Regulatory authorities, particularly the National Bank, should enhance enforcement and oversight mechanisms to ensure that financial institutions adhere to existing directives, such as ATM reconciliation and refund of funds. While the Licensing and Authorization of Payment System Operators Directive (ONPS/02/2020) mandates the reconciliation and refund of funds for ATM non-dispense errors within specific timeframes, interviews with participants suggest that many banks are not complying with these directives. There is a need for better enforcement and oversight.
- Given the emergence of virtual banking in Ethiopia, the regulatory framework should be updated to explicitly address the unique characteristics and challenges associated with this form of banking. This may include the establishment of specific guidelines and requirements for virtual banks.

Based on the findings from analysis of the digital banking structure within the selected banks and based on level of Ethiopia comparing to other African country, the following recommendations provided as:

- Banks can explore opportunities to integrate with a wider range of card networks, such as Visa, Union Pay, and American Express, to offer customers more payment options.
- Banks should consider deploying dedicated Digital Banking Officers at branch levels to ensure effective management of digital initiatives and assess the potential of introducing POS agent services to expand the reach of banking services to underserved areas.
- Strengthen cybersecurity frameworks and strategies to protect digital financial systems and customer data, fostering trust in mobile money services. Also, increase the number of financial agents, particularly in rural areas, to expand access to banking services and promote financial inclusion.
- Banks should invest in staff training and incentives to promote awareness of and willingness to educate customers about digital products and services.

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Appendix: Questionnaires and interview guide

I. Questionnaires



Adama Science and Technology University

School of Humanities and Social Science

Department of Technology and Innovation

Dear Madam/Sir,

I am Mr. Abdin Tekalign, a postgraduate student at Adama Science and Technology University. This research aims to assess **Assessment of Digital Transformation in Ethiopia's Financial Sector: A Case Study of Selected Bank's in Ethiopia**. I am requesting you to participate in this research by completing the following questionnaire. Your participation is entirely voluntary, and all information collected in this survey will be kept strictly confidential. The information gathered will only be used for the following study purposes. Thank you for giving your valuable time to complete the following survey questionnaires.

Yours Faithfully,

Abdin Tekalign

1. Respondent's profile:

1.1 Position: _____

2. Company profile

2.1 Company Name: _____

2.2 Type of bank :

Commercial Bank ☐

Investment Bank ☐

Cooperative Bank ☐

Credit Unions ☐

Other, please specify: _____.

3. Digital banking organization structure related questions

3.1 Does your bank have a digital banking structure?

☐ Yes ☐ No

If No, please specify the reason: _____

3.2 Does your bank have digital banking in addition to traditional banking?

☐ Yes ☐ No

If No, please specify the reason: _____

3.3 Does your bank have a digital department at its head office?

☐ Yes ☐ No

If No, please specify the reason: _____

3.4 Does your bank have a digital department at the district level?

☐ Yes ☐ No

If No, please specify the reason: _____

3.5 Does your bank have an assigned digital banking officer at the branch level?

☐ Yes ☐ No

If No, please specify the reason: _____

3.6 Does your company have any related department with technology transformation, innovation management at head office?

☐ Yes ☐ No

If No, please specify the reason: _____

4. Adopting digital banking technology service-related questions

1. Which digital banking technology adopted your bank?

Check all that apply.

- ☐ A) Internet banking
- ☐ B) Mobile banking
- ☐ C) ATM (Automated teller machine)
- ☐ D) ITM (Interactive teller machine)
- ☐ E) POS
- ☐ F) Mobile money
- ☐ G) Agency banking

Other, please specify _____

2. If you selected Internet banking

Please select services under Internet banking

Check all that apply.

- | | |
|--|---|
| ☐ Check Balance | ☐ Bulk transfer |
| ☐ View Account | ☐ Standing Orders |
| ☐ Statement Control Progress | ☐ Cheque services |
| ☐ Pay Bills | ☐ Mobile Top Up |
| ☐ Bank to bank transfer | ☐ Mini Statement |
| ☐ Account to account transfer | ☐ Utilities payment |
| ☐ Exchange Rates | ☐ Pay and manage beneficiary |
| ☐ ATM card management | ☐ Check branch/ATM locations |

Other, please specify _____

3. If you selected Mobile banking

3.1 Is your mobile banking accessed via?

Check all that apply.

- ☐ Mobile Application ☐ USSD Application

3.2 Please select services under mobile banking.

Check all that apply.

- | | |
|--|---|
| ☐ Check Balance | ☐ Standing Orders |
| ☐ View Account | ☐ Cheque services |
| ☐ Pay Bills | ☐ Mobile Top Up |
| ☐ Bank to bank transfer | ☐ Mini Statement |
| ☐ Account to account transfer | ☐ Utilities payment |
| ☐ Exchange Rates | ☐ Pay and manage beneficiary |
| ☐ ATM card management | ☐ Check branch/ATM locations |

Other, please specify _____

4. If you selected ATM (Automated teller machine)

4.1 Please select which type of cards provided by your bank

- ☐ Debit cards
- ☐ Credit cards
- ☐ Prepaid cards
- ☐ Virtual cards

Other, please specify _____

4.2 select services under your ATM (Automated teller machine)

- | | |
|--|---|
| ☐ Transfer of funds | ☐ Print balance statement |
| ☐ Cash withdrawals | ☐ Bill payments |
| ☐ Balance check | ☐ Depositing Cash |
| ☐ Mobile recharges | ☐ Card less Cash Withdrawals |

Other, please specify _____

4.3 Please select Card Network providers that are integrated to your ATM and POS Machine

- ☐ American Express
- ☐ Discover
- ☐ Mastercard
- ☐ Union Pay

☐ Visa card

☐ JCB

☐ Diner club card

Other, please specify _____

5. If you selected ITM (Interactive teller machine)

Please select services under ITM (Interactive teller machine)

Check all that apply.

☐ Cash Deposit

☐ Cash withdrawals

☐ Getting new e-banking services

☐ Opening new checking and
savings accounts

☐ Bill payments

☐ Print statement

☐ Purchase FCY cash notes

☐ Cash Payment from Saving Account

☐ Cash Payment from Current Accounts
and Bankers Cheque

☐ Payment for Local Money Transfer

☐ Fund Transfer to another bank

☐ Account transfer

☐ Request new e-banking services

☐ Account opening

Other, please specify _____

6. If you selected POS machine

Please select services under your POS machine

☐ Cash withdrawal

☐ Cash deposit

☐ Airtime Top-up

☐ Bill payments

☐ Balance inquiry

☐ Transfer account to account

☐ Receipt printer

If there are other services, please write them. _____

6.1 Does your bank have POS agents?

☐ Yes ☐ No

IF your answer is Yes, please select services under POS agents

☐ Cash withdrawal

☐ Cash deposit

☐ Airtime Top-up

☐ Bill payments

☐ Balance inquiry

☐ Transfer account to account

☐ Receipt printer

If there are other services, please write them. _____

6.2 Does your bank have POS Merchants?

☐ Yes ☐ No

IF your answer is Yes, please select services under POS agents

☐ Cash withdrawal

☐ Cash deposit

☐ Airtime Top-up

☐ Bill payments

☐ Balance inquiry

☐ Transfer account to account

☐ Receipt printer

If there are other services, please write them. _____

7. If you selected Mobile money

Please select services under your mobile money services

- | | |
|---|---|
| ☐ Fund Transfer to account | ☐ Wallet account information |
| ☐ Fund Transfer wallet to wallet | ☐ Cash withdrawal from agent |
| ☐ Bill Payment | ☐ Cash deposit to agent |
| ☐ Pay at merchant | ☐ Airtime top-up |

Other, please specify _____

8. If you selected Agency banking

Please select services under your Agency banking

- | | |
|---|---|
| ☐ Opening E-Wallet Account | ☐ Cash withdrawals |
| ☐ Airtime Top-up | ☐ Bill payments |
| ☐ Merchant's services | ☐ P2P transfer |
| ☐ Balance inquiries | ☐ Utility bills |
| ☐ Cash deposits | ☐ Mini Statement |

If there are other services, please write them. _____

Appendix II.

Interview

General Interview questions

1. Factors preventing technology adoption related question

4.1. What are the factors influencing technology adoption in your bank?
