



**ADDIS ABABA UNIVERSITY
COLLEGE OF BUSINESS AND ECONOMICS**

**THE EFFECT OF E-BANKING ON FINANCIAL PERFORMANCE: THE CASE OF
COMMERCIAL BANKS IN ETHIOPIA**

**PROJECT SUBMITTED TO MBA PROGRAM FOR PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE MBA IN FINANCIAL SERVICE**

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DECLARATION

STUDENT'S DECLARATION

This is my original work and has not been presented for a degree in any other university.

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ADVISOR'S DECLARATION

This Project has been submitted for examination with my approval as university advisor

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The project prepared by Abebaw Siraj with the title “The Effect of E-Banking on Financial Performance: The case of Commercial Banks in Ethiopian” and submitted for Partial Fulfillment of the Requirements for the Degree of MBA in Financial Service, complies with the regulations of the university and meets the accepted standards with respect to originality and quality.

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FIGURE

Figure 1: Conceptual framework**Fehler! Textmarke nicht definiert.**27

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ABBREVIATION AND ACRONYMS

ATM – Automatic Teller Machine

CAMELS – Capital Adequacy, Asset Quality, Management efficiency, Liquidity and Sensitivity

CRM – Customer relationship Management

DOI – Diffusion of Information

E-banking – Electronic Banking

GDP – Gross Domestic Product

ICT – Information and Communication Technology

IT – Information Technology

NBE – National Bank of Ethiopia

OTP – One Time Password

PIN – Personal Identification Number

POS – Point of Sale

ROA – Return on Asset

ROC – Return of Capital

SMS – Short Message Service

TAM – Technology Acceptance Model

TTF – Task Technology Fit

UFIRS – Uniform Financial Institutions Rating System

USSD – Unstructured Supplementary Service Data

WAP – Wireless Application Protocol

ABSTRACT

The impact of E-Banking on financial performance in Ethiopia, for the case of commercial banks, is not adequately assessed and measured. The main objective of the study is examining the effect of e-banking on financial performance in commercial banks that exist in Ethiopia. The study covers all commercial banks that were registered and licensed by National Bank of Ethiopia and exist in the period of 2014 to 2019 Fiscal Years. Major financial performance measures that are used in financial institutions such as profit, capital growth, asset quality, and fund mobilization are considered as dependent variables while e-banking products (card banking, mobile banking, Automatic Teller Machine banking and Point of Sale banking) as independent variables. Random or Fixed effect panel regression analysis made on each financial performance model in order to identify the effect of independent variables on dependent variable. The study result shows that Mobile Banking is statistically significant for capital, Non-performing asset, and deposit performance. ATM banking also has statistical significant effect on profit, capital, Non-performing asset, and deposit performance. Similarly, POS banking has statistical significant on profit, capital, and deposit performance. Card banking is also has statistical significant for profit, Non-performing asset, and deposit performance. The overall result indicates that IT investment, in this case e-banking services, has effect on banks major financial performance. As effect of e-banking product differ on banks financial performance measures both in magnitude and direction, the researcher recommends that a bank shall consider its financial performance strategy while passing IT investment decisions. Internet banking and agent banking are drops in the research due to data inaccessibility and data stationary problems respectively.

Key words: IT investment, E-Banking, Financial performance and Panel Data Analysis

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

Electronic Banking also known as e-banking, is an electronic payment system that enables either banks or customer of a bank to do financial transaction such as deposit, withdrawal, loan payment, loan disbursement, bill payment, transfer using developed infrastructure by financial institutions in simple and convenient way. It greatly minimizes branch banking which was the traditional way physical customers accessed or brick and mortal banking services(BOBPAY, 2018).

Banking in Ethiopia has undergone remarkable changes since 1991 following the change of government. The era of armchair banking has gone. It has become a different ball game in terms of competition and its inherent strategies. This transition eventually brings the Ethiopian banks to be in need of adopting different technologies (Dawit, 2017).

E-banking first conceptualized in the mid-1970s; some banks offered customers electronic banking in 1985. However, the lack of Internet users, and costs associated with using online banking, little growth was observing in e-banking service. The Internet explosion in the late-1990s made people more comfortable with making transactions over the web. Despite the dot-com crash, e-banking grew alongside the Internet (Bob, 2017).

The emergence of E-banking in Ethiopia goes back to the late 2001, when the largest state owned, Commercial Bank of Ethiopia (CBE) introduced ATM service in the country with eight ATMs machine and followed by Dashen Bank S.C. CBE has had Visa membership since November 14, 2005 (Habte, 2019).

E-banking provides vivid benefit for customers and banks. For case of customer it helps to transact twenty four hours in a day and 7 days in week at or nearby station as per the preference of customer. It also decreases cash storage risk in the pocket or in house as well as searching the bank for deposit or withdrawal or transfer money. For the case of the financial institution e-banking has many benefits. Major benefits are increase in accessibility to customer, decrease in branch expansion, minimize manpower requirement, increase product cross-selling, increase

credit collection, minimize cash holding cost, and automate dull tasks, decrease transaction error (risk is already transfer to customers) having well organized data. This indicates that e-banking makes the bank efficient and profitable. It also serves for the bank as competitive advantage (Hasan O. & Talal B., 2012).

Currently most of the commercial bank of Ethiopia invests on IT infrastructure to be competent and harvest benefits that come from e-banking. However, the impact of e-banking on the bank efficiency and performance has not been adequately and empirically measured in Africa in general and in Ethiopia in particular. According to Hanna et al, (1996) effort and empirical data of IT impact on organization assessment was near to nil in developing countries. Most of the research work that has done on the area of IT investment in financial service of Ethiopia dealt with opportunity and challenge which would be expected to be done before emerging IT investment in the country in order to maximize the benefit of the technology.

Whether the level of investment done in IT actually brings real benefits to the banks, is still a matter of debate in academic circles. No knowledge exists that defines clearly the impact of investment in IT on the financial performance of the whole commercial banks in Ethiopia (Dawit 2017). IT performance on efficiency performance such as minimize manpower involvement, minimize transaction time, increase data quality, increase decision making etc. measure in to quantitative financial term is also have challenges.

Despite IT investments in banking are expected to be justified through business cases at project stage the value proposition of e-banking in terms of the financial performance of banks is not quantified and disclosed to the public. Therefore, this research aims to assess the effect of IT investment and e-banking on financial performance of commercial banks in Ethiopia.

1.2. Statement of the Problem

Now days, commercial banks in Ethiopia are competing each other by delivering different payment channel options to their customers in order to maintain or expand their market share in the financial industry of the country. The major payment channel that avail in Ethiopian banks are Automated Teller Machine, Internet Banking, Mobile Banking, Electronic Clearing Service, Electronic Fund Transfer, Smart Card, Point of Sale and agent banking. These payment channels require one time and recurring investment cost. While the rapid development of information

technology has made some banking tasks more efficient and cheaper, technological investments are taking a larger share of bank's resources (Hannington, 2013). Based on the nature of the investment and the regulatory requirement, it is recorded as periodic expense or asset to be amortized in the future. Some of the bank balance sheet indicates, IT investment asset comes in third after the loan and advance and building and equipment. IT investment also contributes 46% of fixed asset (Rahel,2016). The National Bank of Ethiopia also no limit for IT infrastructure investment made by a bank. As principle, benefit of investment should surpass cost of investment. Plan and actual performance Variances on investment should be monitored and managed on time as required. Moreover, additional investment also expected to be made after utilized the first investment efficiently. However, either the supervisory organ or the banks themselves not examine the cost benefit analysis of the bank investment. The current focus point of bank supervisor is bank modernization and financial inclusion while the bank focal point is to be competent as well as go with the bank supervisory organ plan and agenda. In addition, IT investment is the recent phenomena in Ethiopia bank, the effect of IT investment expected to lag. As a result of these and the like reasons the cost benefit of IT investment or impact assessment in financial terms made in the commercial banks of Ethiopia has not adequately examined yet (Dawit, 2017).

Researchers and professionals have presented several models for accessing return on ICT investment from the financial and non-financial perspectives such as public return, social return and financial return (Farrukh, 2012). Even though expected returns from IT investment in banks increase while the customer literate and awareness level, the current IT investment return shall be measured using proxy methods. The reason for IT investment in bank is to increase efficiency that results in profitability. Therefore, this research plans to measuring the impact of IT investment in general and e-banking in particular on Ethiopian banking sector financial performance.

1.3. Research questions

In light of the problems discussed above the study specifically aims to address the following research questions

1. What are the effects of e-banking services on financial performance?

2. How to maximize the benefit of e-banking to increase banks financial performance?

1.4. Objectives of the study

1.4.1. General objective

The general objective of this study is to measure financial performance after IT investment especially e-banking solution and infra-structure development in commercial banks of Ethiopia.

1.4.2. Specific Objectives

The study specifically aims to:

1. Identify the effect of e-banking on financial performance in Ethiopian commercial banks, CAMELS perspective.
2. Maximize the benefit of e-banking service on financial performance in Ethiopian commercial banks.

1.5. Significance of the study

This study has importance to Ethiopian commercial banks showing that IT investment impact on bank financial performance. Academicians will also benefit from this work using the study for reference and further research on findings. Similarly, the study will provide good lesson to policy makers that be initiate to review existing rules and regulations for the sake of the benefit of the public at large.

1.6. Scope and Limitation of the study

The scope of the study comprises all commercial banks exist and work in the period of 2014-2019. Fiscal end performance report for six years are collected for each bank according to variables being considered and arranged in the form of panel data for further analysis. The variables being considered are banks capital, deposit, profit and provision as dependent variables and the explanatory variable E-banking products such as ATM, POS, Card and Mobile, ATM & POS banking.

It is believed that the impact of each IT investment and e-banking product performance on bank financial performance shall be recorded and stored in systematic way in each bank. Holding this assumption in mind the researcher tries to collect the information from banks that work in the

country. Due to data confidentiality the banks are not cooperative. Then the researcher tried to get the same information from bank supervision body (NBE) with formal letter written by Development Bank of Ethiopia (according to NBE official request). However the response is similar to commercial banks. After great deal with NBE higher officials the high level data is collected. Therefore, due to the confidentiality as well as unavailability of detail data on IT investment and E-banking product performance, this study is done on high level related data that exist in NBE. The other limiting factor for this study is time and COVID-19. COVID-19 also limits face to face communication and discussion with data providers and advisor of the study.

CHAPTER TWO

LITERATURE REVIEW

In this part issues such as content, idea, theory, model and empirical study on Information and communication technology investment and its impact on banking performance that are relevant to the research topic are well discussed.

2.1. Theoretical Literature reviews

2.1.1. Definition of ICT

Information technology cover systems of information, Internet, information and communication related technologies, and their infrastructure including computer software, networks and hardware, which processes or transmit information to enhance the effectiveness of individuals and organizations. However, term information technology also includes any computer application and required packages of hardware, Computer Aided Manufacturing, Computer Aided Design, Electronic Data Interchange and Enterprise Resource planning that positively affects the productivity of cooperation (Choo & Shahryar, 2013).

2.1.2. IT Investment and its impact

There are so many theories that applicable for IT investment impact analysis. Most of them are derived or customize from other field of study. Theories that significantly go with the study are discussed as follows.

1. Productivity Paradox Theory: The productivity paradox (also the Solow computer paradox) is the peculiar observation made in business process analysis that, as more investment is made in information technology, worker productivity may go down instead of up (Robert, 1987).
2. Diffusion of Innovation (DOI) Theory, developed by E.M. Rogers in 1962, is one of the oldest social science theories. It originated in communication to explain how, over time, an idea or product gains momentum and diffuses (or spreads) through a specific population or social system. Four main elements that influence the spread of a new idea are the innovation, communication channels, time, and the social system. Diffusion of innovations manifests itself in different ways in various cultures and fields and is highly subjective to the type of adopters and innovation decision process.

3. Task-technology fit (TTF) theory: The main concept of this theory is the technology needs to be design according to the task nature and flow. If this principle is applied, the individual performance of the organization will increase. Whether the technology fit to task or not is checked by quality, locatability, authorization, compatibility, ease of use/training, production timeliness, systems reliability, and relationship with users (Goodhue & Thompson1995).
4. Technology Acceptance Model (TAM) has been widely applied to study individual technology acceptance behavior in various types of information systems. Two primary factors influencing an individual's intention to use new technology: perceived ease of use and perceived usefulness. Technology Acceptance Model has been developed by (Davis,1989) is one of the most popular research models to predict use and acceptance of information systems and technology by individual users.
5. Resource Based View Theory: The resource-based view argues that firms shall have resources that create competitive advantage and sustain for long term performance. Resource based view analyzes and interpret internal resources of the organizations and emphasizes resources and capabilities in formulating strategy to achieve sustainable competitive advantages. Resources may be considered as inputs that enable firms to carry out its activities. The Resource-Based Model of Above-Average Returns : assumes that each organization is a collection of unique resources and capabilities; the uniqueness of resources and capabilities is the basis for a firm's strategy and its ability to earn above average returns. Above-average returns are earned when the firm uses its valuable, rare, costly-to imitate, and non-substitutable resources and capabilities to compete against its rivals in one or more industries (Barney, 1991).
6. Dynamic capabilities: the ability to integrate, build, and reconfigure internal and external competencies to address rapidly-changing environments. The concept of dynamic capabilities arose from a key shortcoming of the resource-based view of the firm. IS resources may take on many of the attributes of dynamic capabilities, and thus may be particularly useful to firms operating in rapidly changing environments(Michael & John, 2004). Thus, even if IS resources do not directly lead the firm to a position of superior sustained competitive advantage, they may nonetheless be critical to the firm's longer-

term competitiveness in unstable environments if they help it to develop, add, integrate, and release other key resources over time.

7. Organizational learning theory is a process which focuses on how knowledge is created and how it is used within the organization. A key concept in this theory is that learning occurs from our interactions when we are detecting and correcting errors. Better organizational learning contributes to better use, deployment and management of modern information-communication technologies. At the same time ICT can be seen as enablers of higher-level organizational learning (Vlado, 2004).

In business administration, absorptive capacity has been defined as "a firm's ability to recognize the value of new information, assimilate it, and apply it to commercial ends". It is studied on individual, group, firm, and national levels. Antecedents are prior-based knowledge (knowledge stocks and knowledge flows) and communication. Studies involve a firm's innovation performance, aspiration level, and organizational learning. It has been said that in order to be innovative an organization should develop its absorptive capacity (Cohen & Levinthal,1990).

2.1.3. IT impact analysis Model

Information technology impact on an organization has been assessed by qualitative or quantitative approaches or both at a time. Information technology success mainly measured by system quality, information quality, use of information, user compatibility and organization impact. A synthesis that made by Chief Information Officer (1992) indicates that effect of IT on organization performance is assessed by different models according to its fitness. The models are:

1. Balanced Score Card – In this method both operational and financial measures are used. The four measures in this model are customer, internal process, financial and employee development.
2. Information Economics – This model requires to identifying the objective of the company and categorize in to tangible and intangible and then provide weight to them. This IT model also needs IT system that processes the data and provides result of the impact of IT on an organization. In this case validation the result using similar group is essential.
3. Impact Focus Strategy – This is a type of IT impact assessment model using planed value/benefit as benchmark.

4. Value Framework - This method uses a grid to define multiple impacts of an information system based on two dimensions namely impact and value. The value dimension includes additional service/product quality cost by technology. The impact dimension included time compression of processes, overcoming geographic restrictions and restructuring business relationships.
5. Alternative Payoff Scenario – it measures the IT investment returns both monetary and non-monetary value by comparing impact result before and after investment adoption.
6. Return on Management- this model is working while the Information technology plans to improve managerial performance. The performance of IT in this case is measured the ratio of management output to management input ratio.
7. Embedded Network Productivity Measurement Model - This approach predefines measurement parameters, which are built into network management software, and real time indices of compliance with performance targets are generated.

2.1.4. Electronic Banking

Electronic banking is a form of banking in which funds are transferred through an exchange of electronic signals rather than through an exchange of cash, checks, or other types of paper documents. Electronic banking relies on intricate computer systems that communicate using telephone lines. These computer systems record transfers and ownership of funds, and they control the methods customers and commercial institutions use to access funds. There are various electronic banking systems, and they range in size. An example of a small system is an ATM network, a set of interconnected automated teller machines that are linked to a centralized financial institution and its computer system. An example of a large electronic banking system is the Federal Reserve Wire Network, called Fedwire. This system allows participants to handle large, time-sensitive payments, such as those required to settle real estate transactions, (encyclopedia.com, 2020).

Major opportunities offered by Technological developments are: Reducing cost per transactions; Broadened and easier access to target customers; More efficient system and techniques for dealing with information on customers (CRM); Possibility of diversifying into new business: increase controlling internal processes efficiency; and facilitate decision making (Mudasir et al, 2015).

ICT has different cost components. The major components of ICT cost are consultation service, corporate software application, network and communication, maintenance, processing system, database management, and internet. In 2010, IT investment data of USA shows USD 811 Million.

2.1.5. Types of Electronic-Banking

Naming and classification of electronic banking differences are exhibited from literature to literature. Hereunder very common electronic banking in Ethiopia are listed and discussed.

2.1.5.1. ATM

An automated teller machine (ATM) is an electronic telecommunications device that enables customers of financial institutions to perform financial transactions, such as cash withdrawals, deposits, funds transfers, or account information inquiries, at any time and without the need for direct interaction with bank staff. There are two types of ATMs. ATM that provides cash withdrawal and balance updating service to the customer is called basic whereas ATM that accepts deposit and allows account to account transfer in addition to the basic function is called complex machine. Installment of ATM will be done in bank premises or out of it. The technology of ATM service requires more cost comparing to other e-banking service because it requires manpower requirement, machine investment and card development cost.

2.1.5.2. Mobile Banking

Mobile banking refers to the use of a cellular device to perform online banking tasks such as monitoring account balances, transferring funds between accounts, bill payment and locating an ATM. There are three types of mobile banking application such as wireless Application Protocol (WAP), SMS (also known as SMS Banking) and Unstructured Supplementary Service Data (USSD). Bill payment, account to account transfer, loan payment will be done using mobile banking. It is secure from online banking and does not need internet (Karabi, 2013).

2.1.5.3. Internet Banking

It is a means of conducting transaction accessing the bank website using computer. Internet is mandatory during processing transaction in internet banking. In addition to payments and transfer facilities, internet banking has non-financial service facilities such as send and follow up check clearing process.

2.1.5.4. Point of Sale Banking

It is a terminal or electronics device that install in the service provider as well as in super markets organizations to facilitate non-cash on-sight payment of the client against the bank card or mobile account. In this case the bank purchases the device, load required software, make interface with bank network and provide to the client. It is best to the bank to hold deposits for a bit longer to serve for credit compared to other e-banking systems.

2.1.5.5. Agent Banking

In most developing countries, the banking sector has adopted several delivery channels to ensure that financial services reach both the banked and the unbanked especially in the remote areas. Agency banking will enhance the access to financial services, and at reduced expenses in rural regions, (David, 2016).

2.1.5.6. Branch Network

Organizations are expand or get accessed by society at large using branch network, Branch network is established physical presence to the public. Branches are linking its principal or other branch to perform common goal using different interfaces. One is manual and the other is technological networked. Networked organization is expected to pass decision fast then the non-networking organization. Moreover, networking organization decreases manpower cost and increase information quality comparing ton non-networked one in addition to creating satisfaction to the customer. The main challenges for networking company are reconciliation and follow up issues. The number of branches a company has also impact on the company performance.

2.1.5.7. Card banking

A bank card is typically a plastic card issued by a bank to its clients that performs one or more of a number of services that relate to giving the client access to bank account. Physically, a bank card will usually have the client's name, the issuer's name, and a unique card number printed on it. Banking Cards (Debit / Credit / Cash / Travel / Others) banking cards offer consumers more security, convenience, and control than any other payment method. These cards provide 2 factor authentications for secure payments e.g secure PIN and OTP. RuPay, Visa, MasterCard are some

of the example of card payment systems (Joseph, 2019). Bank cards let customers' access funds in checking or savings accounts or make purchases against a line of credit (Bankrate.com).

2.1.6. Financial Performance

Financial performance principally reflects business sector outcomes and results that shows overall financial health of the sector over a specific period of time (Farah, 2016). It indicates that how well an entity is utilizing its resources to maximize the shareholders wealth and profitability. Financial performance is a subjective measure of how well a firm can use assets from its primary mode of business and generate revenues. The term is also used as a general measure of a firm's overall financial health over a given period. It is measured by employing different kinds of financial ratios analysis which drive from major financial statement position.

In general, financial ratios can be broken down into four main categories—1) profitability or return on investment; 2) liquidity; 3) leverage, and 4) operating or efficiency. However, according to the business nature the number of financial ratio grouping and computation (component) differs (INC.com).

2.1.6.1. Major financial performance indicator of Banks

Under the UFIRS, each financial institution is assigned a composite rating based on an evaluation and rating of six essential components of an institution's financial condition and operations. These component factors address the adequacy of capital, the quality of assets, the capability of management, the quality and level of earnings, the adequacy of liquidity, and the sensitivity to market risk. Evaluations of the components take into consideration the institution's size and sophistication, the nature and complexity of its activities, and its risk profile (William, 1997).

2.1.6.1.1. Capital adequacy

It is the ratio of capital to risk weighted asset. This ratio is affected by three major factors such as change of volume and status of risk weighted asset, capital injection and internal capital growth due to return on asset. It is the major focus of supervisory organ due to measuring the capacity of bank resilience during financial crises or business distress.

2.1.6.1.2. Asset quality

The asset quality rating reflects the quantity of existing and potential credit risk associated with the loan and investment portfolios, other real estate owned, and other assets, as well as off-balance sheet transactions. The value of asset may be affected by market problem, depreciation or credit failure. The major risk of the bank is credit failure or non-performing loan asset phenomena (Uyen, 2011).

2.1.6.1.3. Earning

This rating reflects not only the quantity and trend of earnings, but also factors that may affect the sustainability or quality of earnings. The quantity as well as the quality of earnings can be affected by excessive or inadequately managed credit risk that may result in loan losses and require additions to the allowance for loan and lease losses, or by high levels of market risk that may unduly expose an institution's earnings to volatility in interest rates. The quality of earnings may also be diminished by undue reliance on extraordinary gains, nonrecurring events, or favorable tax effects. Future earnings may be adversely affected by an inability to forecast or control funding and operating expenses, improperly executed or ill-advised business strategies, or poorly managed or uncontrolled exposure to other risks (Federal Deposit Insurance Corporation, 2020).

2.1.6.1.4. Liquidity ratio

In evaluating the adequacy of a financial institution's liquidity position, consideration should be given to the current level and prospective sources of liquidity compared to funding needs. Trend and stable deposit are the focus of bank liquidity management (Uyen, 2011).

2.1.6.1.5. Sensitivity to Market Risk

The sensitivity to market risk component reflects the degree to which changes in interest rates, foreign exchange rates, commodity prices, or equity prices can adversely affect a financial institution's earnings or economic capital. When evaluating this component, consideration should be given to: management's ability to identify, measure, monitor, and control market risk; the institution's size; the nature and complexity of its activities; and the adequacy of its capital and earnings in relation to its level of market risk exposure (Ranjana & Paul, 2000).

2.1.6.1.6. Management

The capability of the board of directors and management, in their respective roles such as to identify, measure, monitor, and control the risks of an institution's activities and to ensure a financial institution's safe, sound, and efficient operation in compliance with applicable laws and regulations is reflected in this rating. Generally, directors need not be actively involved in day-to-day operations; however, they must provide clear guidance regarding acceptable risk exposure levels and ensure that appropriate policies, procedures, and practices have been established. Senior management is responsible for developing and implementing policies, procedures, and practices that translate the board's goals, objectives, and risk limits into prudent operating standards (Ranjana & Paul, 2000).

2.1. Empirical Literature Reviews

2.2.1. Related Empirical Study In the world

Feng-Wen et al., (2018) assessed the impact of financial inclusion on non-performing loan in china banks using panel data which was taken in the period of 2005-2016 from 31 provinces. Fixed effect model for empirical test was also used. The final result of the research indicates that the financial inclusion is negative significance on non-performing loan of the bank.

Bnuyo&Aregbeshola (2014), in their paper review indicated that “Kozak (2005) find that the value of the return on asset for the US banking sector has increased by 51% thereby suggesting that improvement in ICT investment, associated with extensive office networks and range of offered services have helped to generate additional revenues for banks thus pointing to the fact that a huge number of diverse operations require higher ICT investment.”

K. Batu et al (2015) in their study in title “Interaction Between Internet Banking and Bank Performance: The Case of Europe” shows that internet banking has effect on ROA and ROE. The study includes 30 European countries and non-European countries banks eight year data (2005-2013) and descriptive statistics technique as well as Demitrescu-Hurlin panel causality tests employed.

Muhammad et al. (2015) in their study on the relation of asset quality and advent of e-banking on 5 banks of Pakistan using 5-year asset quality assessment before and after e-banking

implementation result indicates that asset quality was increase in all banks after e-banking implementation. The researchers use descriptive statistical analysis techniques.

Nicola & Yannicj (2020), studied on importance of technology in banking using column analysis. The researchers also assess the resilience of banking during crises time based on IT adoption. The study result shows that bank that adopts IT is more stable or recover loan than non-IT adopt banks. The research work also indicates the newly developed technologies that increase the loan asset of the bank such as foot digital and IT credit scoring.

Mohammed (NA) studied on the impact of e-banking on performance of Jordan banks collecting 10 years panel data from 15 commercial banks. Using ordinary least square regression banks that have e-banking service and have no e-banking service financial performance was measured by controlling variables such as bank size, capital, credit risk and liquidity. At end, the research indicated that banking has a significant negative impact on banks' performance.

2.2.2. Related Empirical Study in Africa

Bnuyo&Aregbeshola(2014), studied on relationship between Information and Communication Technology on four major South Africa commercial bank performances. The researcher used thirteen years panel published banks data. Regression analysis was applied to get using ROA and ROC as performance measure or predicted variable and ICT investment and ICT cost efficiency as predictor variable. The result of the study indicates that ICT investment and ICT cost efficient variable has statically significant on the bank performance such as ROC & ROA. The study also indicates that ICT cost efficiency has more impact on ICT investment. The researchers recommend that banks emphasize policies that will enhance proper utilization of ICT equipment rather than additional investments.

Matthew & Ibikunle (2012), made a Case study of the Nigerian Banking Industry on ICT impact on banks. The researchers collect productivity, market structure, Innovation and value chain information in the form of questionnaire. Case studies of the IT platform of two banks also included for more inference. They also applied descriptive statistical analysis on scale type questionnaire. The study concludes that basic ICT infrastructures such as computer and peripherals, local area networks, and ATMs are crucial to the operations of banks. However, the

case studies indicate that to meet the ever-increasing sophistication of customers, new government policies and stay competitive in a fast-changing economy, a scalable, flexible and robust ICT solution is essential.

Madueme (2010), Assessed the impact of information technology on 13 banks performance that exist in Nigeria using transcendental logarithmic production function and CAMEL rating conclude that the performance of banks increase after technology adoption. The researcher used both primary and secondary data.

Gideon (2016), ICT effect on financial performance study indicates that ICT investment efficiency (cost-effective) increase bank return deposit. The researcher also conclude that there is significant relationship among financial performance (Profit before Tax, Return on Assets, Total Deposits by customers and Return on Capital employed) to ICT investment. Secondary panel data for the period of 2011to 2014, descriptive as well as inferential statistics and quantitative research design were used as research methodology.

Hannington (2013), study on effect of e-banking on financial performance of 44 banks in Kenya overall result shows e-banking has significant effect on bank performance. However, out of five explanatory variables such as ATM, DC card, POS, and EFT (MB, IB, & other electronic transfer) only DC and EFT has statically significant for bank financial performance or profit. The researcher use descriptive research type and employed descriptive and inferential statistics to analysis techniques to analysis and interpret the result.

According to Hussein (2011), IT can improve bank's performance in three ways: IT can reduce operational cost (cost effect) by 41% of the traditional cost, and facilitate transactions among customers within the same network (network effect) and last but not least, it can save the time dramatically. The researcher usefirsthand information from the bank customer and staffs and descriptive statistical method employed and the result was validate from different bank data, journals and books using traditional and IT time data.

Bismark(2015), study in title “examining the impact of information technology on the financial performance of Asutifi rural bank: Ghana” comparative study (before and after the

implementation of information technology) shows there is positive relationship in IT investment and performance of ROC and ROA if and only if other factors be constant.

Felistu (2017), study on internet banking has effect on financial performance of the bank. The researcher also identifies volume of deposit, number of transaction has positive statistical significant on ROA but fee& commission and expenditure has negative relation to ROA. The analysis is made using both descriptive inferential analysis technique on primary and secondary (2012-2016) data of 40 commercial banks.

According to Nijilu (2016), study on e-banking effect on liquidity in 40 commercial banks Kenya using descriptive and inference analysis technique on 5 years data indicates ATM, MB, POS, IB has positive influence on liquidity in different magnitude. Average value transaction per e-banking service type was applied during liquidity to e-banking relation model development. Bank size in the form of asset volume was also considered in the model development.

Sarmilaet al., (2019), assess technology and liquidity relationship in five Asian banks using five years panel data. The researchers define liquidity in two three forms (liquid assets to deposits, liquid assets to total assets and loans to deposits) develop relationship magnitude IT technology (internet, mobile, ATM and security) using regression analysis. The study result indicates liquidity asset to deposit was statistically significant to ATM; liquid assets to total assets statistically significant to ATM and Mobile and loans to deposits statistically significant to internet banking. However there was no relation between liquidity to IT security.

Ahmadu (2015), study in title “The relationship between electronic banking and liquidity of deposit money banks in Nigeria” using descriptive and correlation analysis on 8 years (2006-2014) time series data on total population of the deposit taking bank of Nigeria identify that there was no statistical significant relationship between liquidity (current ratio in this cases) to mobile banking and point of sale. Whereas, significant negative relationship being observed between liquidity and internet banking.

Paul et, al., (2018), studied on mobile banking effect on liquidity of the bank in Kenya banks. The researcher used descriptive research design as well as descriptive and inferential analysis methods. Stratified sampling was applied to select 60 staffs from 40 banks. Questionnaire was

tool that applied to collect the research data. The final result of the study reveals that mobile banking product line of the bank contributes liquidity for the commercial bank of Kenya.

David (2016), studied on agent banking effect on financial performance on 17 Kenya bank that provide agent banking bay taking 3 years secondary data using descriptive research method. The researcher also applied the regression analysis technique to establish the relation of agent banking and bank financial performance ROC as proxy. The finding of the study indicate that agent banking has positive statistical significant on bank performance especially ROC. The researcher finally recommends that agent bank expansion for increase bank financial performance.

Adelowotan&Oshadare (2017), studied on branch network and bank performance taking in to account whole population banks in Kenya by gathering secondary data of 2014 and 2015 of the bank and analysis regression techniques. The study strongly support that branch network growth was associated with total asset growth for the case of Kenya.

2.2.3. Related Empirical Study in Ethiopia

Dawit (2017), assessed the impact of IT investment on commercial banks of Ethiopia by selecting explanatory research methods and taking in to account purposive sampling method 10 years secondary data. The researcher takes return on asset as dependent and IT investment (hardware, software and IT-service) and control variable (employee efficiency, market concentration and inflation) as independent variables and multiple regression model applied. The overall result of the research revealed that IT investment has negative significant impact on the financial performance of commercial Banks in Ethiopia. In case of control variables, only inflation has statically insignificant value for bank performance but the other no impact at all.

According to Betelhem(2018)conducted a study on e-banking performance in Ethiopian commercial banks, number of Number of Branch, ATM, POS has inverse relationship to ROA whereas Number of Mobile Users has direct relationship to the ROA, The researcher uses explanatory research based on qualitative approach. Descriptive and inferential analyses as well as top performer bank in the period of 2013-2017 are applied by the researcher to reach the final conclusion.

Girma (2016), undertook a study on ICT effect on performance commercial banks in Ethiopia using five years (2010-2014) secondary data from six banks result shows IT investment, ATM and POS no statistically significant on ROA while GDP, inflation and branch size statistically significant on ROA. The researcher uses both descriptive and regression analysis for data diversification and variable relationship assessment.

2.3. Summary of literature reviews and research gap

The impact of information communication technology on commercial banks performance differs from country to country. However, most of the researches indicate that it provides positive impact on bank financial performance.

Electronic banking effect on banks performance result also differ from country to country and researcher to researcher in same countries. Most of the research work indicates the relationship between electronic banking and return on asset and return on capital only.

Particular to Ethiopia, most of the research work in electronics banking was focused on “challenge and opportunity”. There are only a few researches works on IT investment or e-banking deployment impact on bank financial performance. Similar to other countries work reviewed as above in case of Ethiopia, the research outputs on same topic shows significance difference. Even though, the number of banks in Ethiopia is seventeen; all of the research works were made in sample base, and not include the e-banking products provided by banks. Moreover, the previous researches did not assess the impact of IT or E-banking on liquidity, asset quality and profit aspect of the bank. Comparative study before adoption of information technology and after has not done.

As the research gap in IT or e-banking effect on financial performance being vast, therefore, this research is designed to add knowledge on identified research gap.

2.4. Conceptual framework

As the theory of resource based and dynamic capability, an organization should have resources which are dynamic and earn above the average of its investment cost. The IT impact analysis model, value framework, define IT benefit in to value (cost) and impact (efficiency). The other IT investment model called “Alternative pay-off scenario” measures the IT investment based on return from investment. Balanced score card analysis model also includes Financial performance (capital growth, profit, cashflow, cost reduction) and innovative (capability) to measure IT investment. Balanced Scorecard is an important concept to examine and translate the organizational strategy by using various factors like financial and non-financial measures (Suresh, 2012).

E-banking such as ATM banking, Mobile banking, Online Banking and agency banking were having strong and positive relation with on banks financial performance (Ogutu&Fotaki ,2019). Automated teller machines, debit cards and point of sale terminals have positive impact on banks financial performance (Damtew,2016). IT investment as resource for banks creates dynamic capability for banks performance.

Because of these and other concept, theory and literature review of the document, the following conceptual framework is developed and the expected relationship among dependent and independent variable is designed.

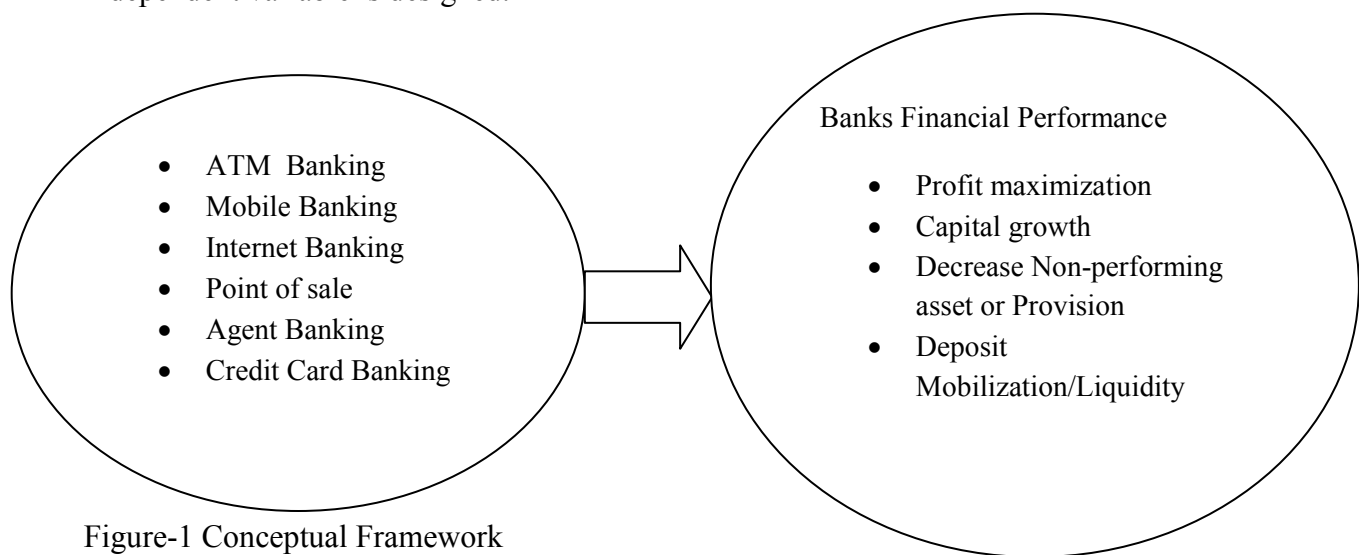


Figure-1 Conceptual Framework

CHAPTER THREE

RESEARCH DESIGN & METHODOLOGY

The purpose of this study is examining the impact of E-banking service on commercial banks' financial performance in Ethiopia. This chapter discusses the research procedure that is used to carry out the study or serve as blueprint for answering the research question of the study. It starts by discussing research design followed by the nature and instruments of data collection, sampling design, method of data process and analysis. Finally, definition of study variables with their measurement and model specifications are presented.

2.1. Research design

The research design is the blueprint that shows research type selection, appropriate data type to be collected and method/s of data analysis.

Commonly, there are three types of research. One is descriptive which is mostly describing the existing situation as it is. The second type is explanatory which is describing relationship or cause and effect among variables. The third type of research is exploratory which is experimental in nature. There is also other type of research called "Longitudinal Research" that carried out longitudinally involves data collection at multiple points in time. Longitudinal studies may take the form of *Panel study*- traces the same sample over time.

Because of the nature of the data to be collected was objective as well as quantitative in nature, and it was collected from different banks across time, longitudinal research type was applied. This research type includes time and individual banks factors as well as easy to identify the impact of independent variables on dependent variables; it has great advantage to increase the research quality.

Therefore, in this study longitudinal research type, quantitative data and both descriptive and inferential data analysis were applied.

2.2. Target Population

Currently Ethiopia has 17 commercial banks that have registered and licensed by National Bank of Ethiopia. Out of these 16 commercial banks are private. Because of the number of commercial

banks are few in number, the researcher has taken the total population of commercial banks currently work in Ethiopia such as Commercial Bank of Ethiopia (state bank), Awash International Bank, Dashen Bank, Nib International Bank, Wegagen Bank, Zemen Bank, United Bank, Abysinia Bank, Oromia International Bank, Oromia cooprtive Bank, Abay Bank, Buna International Bank, Birhan International Bank, Enat Bank, Debub Global Bank, Addis International Bank and Lion Bank.

2.3. Data Collection

In order to carry out the relationship between commercial banks' financial performance and e-banking product as well as IT investment, historical quantitative data is required. So, six years (2014-2019) balanced panel data was collected from National Bank of Ethiopia. A few identified data gap also filled from different sources such as banks' website and publication. Generally, the researcher uses secondary data.

2.4. Data Analysis

In order to examine the impact of e-banking service and IT investment on the performance of commercial banks in Ethiopia, the study used both descriptive and inferential statistics in analyzing the data. Analysis was done with the help of STATA (Version-14) econometric software package. The data was collected with formal letter from National Bank of Ethiopia and pass necessary data cleaning and arrangement process using excel and STATA software then after. Descriptive statistics (Mean, maximum and minimum, standard deviations) was used to analyze the general trends of the data from 2014 to 2019. In order to see the impact of e-banking services toward the selected financial performances, inferential statistics panel model regression analysis were used.

2.5. Model Specification

The major common models for panel data analysis are pooled, fixed time and random fixed models. Based on Haussmann, F-statistics and Unit root test the appropriate model was selected for each model.

The study has four (4) models in order to examine the relationship between financial performance of the banks' and e-banking products as well as IT investments. Each model has

one independent variable and five (5) independent variables. The independent variables are same to each dependent variable.

Equation 1: General Model of Panel Regression

$$Y_{it} = \beta_0 + \beta X_{it} + U_i$$

Where: Y_{it} is the dependent variable for bank 'i' in year 't', β_0 is the constant term, β is the coefficient of the independent variables of the study, X_{it} is the independent variable for bank 'i' in year 't' and μ the normal error term.

Based on the above general panel data model regression formula the estimate model specifications are states as follow:

Model-One: Profit specific Model

$$\text{Profit}_{it} = \beta_0 + \beta_1 \text{CAS}_{it} + \beta_2 \text{ATM}_{it} + \beta_3 \text{POS}_{it} + \beta_4 \text{MOBS}_{it} + u_i$$

Model-Two: Capital specific Model

$$\text{Capital} = \beta_0 + \beta_1 \text{CAS}_{it} + \beta_2 \text{ATM}_{it} + \beta_3 \text{POS}_{it} + \beta_4 \text{MOBS}_{it} + u_i$$

Model-Three: Provision specific Model

$$\text{Provision} = \beta_0 + \beta_1 \text{CAS}_{it} + \beta_2 \text{ATM}_{it} + \beta_3 \text{POS}_{it} + \beta_4 \text{MOBS}_{it} + u_i$$

Model-Four: Deposit specific Model

$$\text{Deposit} = \beta_0 + \beta_1 \text{CAS}_{it} + \beta_2 \text{ATM}_{it} + \beta_3 \text{POS}_{it} + \beta_4 \text{MOBS}_{it} + u_i \text{ Where;}$$

➡ β_0 is intercept

➡ $\beta_1, \beta_2, \beta_3,$ and β_4 represent estimated coefficient for specific bank i at time t,

➡ CAS, ATM, POS, ABS and MOBS refer Card Subscriber, Automatic Teller Machine, point of sale machine Agent banking subscribers and Mobile Banking subscribers respectively.

➡ U_i represents error term

➡ The coefficients of explanatory variable were estimated by the use of fixed effect panel modeling technique

2.6. Definition of variables

The nature of the variables is derived directly or indirectly from existing theory, concept and researches which was reviewed. In order to show the relationship among variables clearly as well as to avoid confusion during interpretation at research result, all kinds of variables considered in the research should be properly defined.

2.6.1. Dependent Variables

In this study there are four dependent variables.

1. **Profit** – It is the final financial performance measure of any financial institution. In order to include some of the banks' data that do not finalize audit report provisional profit before tax is used for this study. Profit could not cumulate for years or it is temporary account, so the researcher takes each year profit.
2. **Capital** – it is the investment of the owner that could be increase by internal company performance or additional owners' investment but decrease while the company net profit performance below zero. In order to see the impact of IT investment and E-banking service, year to year incremental of capital that come from internal performance of the banks are considered in the study.
3. **Provision**- it is credit balance asset that hold based on the banks asset that expect to exposure to risk or default. The amount of it or the ratio of this asset to total asset is the measure of the banks' asset quality. Similar to profit, this account is adjusted especially at the end of fiscal year, so it also has no cumulative nature. The researcher takes each year provision asset position for this study in order to see impacts of IT investment and e-banking service towards increase asset quality.
4. **Deposit** – it is the main fund mobilization activity of the bank. The main fund source of credit in banks is deposit. The major income source of the bank is interest income that

gains from credit. So for this study deposit movement from year to year is also considered as measure of financial performance especially for liquidity purpose.

2.6.2. Independent variables

Independent variables are explanatory variables that explain the dependent variables. In case the independent variables included in this study and respective definition are stated as follows:

1. **Automatic Teller Machine** – it is a bank machine that delivers cash and account withdrawal service to the bank customer. The researcher considers the number of ATM installation per year to increase the service quality and efficiency.
2. **Point of Sale Machine** - it is a bank machine that delivers cash and account withdrawal service to the bank customer. The researcher considers the number of POS installation per year to increase the service quality and efficiency.
3. **Card Subscriber** – It is the net of number of new card issue and cancelled previous ones according to the customer request per year.
4. **Mobile Banking Subscriber** - It is the net of number of new license issue and cancelled previous ones according to the customer request per year.
5. **Agent Banking** - It is the net of number of new agent registration and withdrawal of previous ones according to the agent request per year.

2.7. Summary of variables, unit of measurements and expected significance on banks financial performance measures

Technology has changed the contours of three major functions performed by banks, i.e., access to liquidity, transformation of assets and monitoring of risks. Further, Information technology and the communication networking systems have a crucial bearing on the efficiency of money, capital and foreign exchange markets. In the long run a bank can save on money by not paying for tellers or for managing branches. Plus, it's cheaper to make transactions over the Internet by using technology. E-banking decrease operational risk to the bank (Essays, UK. 2018). IT investment includes or drives the e-banking products.

E-banking such as ATM banking, Mobile banking, Online Banking and agency banking were have strong and positive relation with on banks financial performance (Ogutu&Fotaki ,2019). Automated teller machines, debit cards and point of sale terminals have positive impact on banks

financial performance (Damtew, 2016). IT investment as resource for banks creates dynamic capability for banks performance.

Based on the above and other concepts stated in different literature review of the document including researcher exposure, the expected impact of e-banking on banks financial performance was summarized and stated in the table below.

Table 1: Summary of variables

Independent Variables	Measurements	Expected Significant on Profit	Expected Significant on Capital	Expected Significant on Provision	Expected Significant on Deposit
Card Subscriber	Number of customer	+	+	-	+
Mobile Banking Subscriber	Number of customer	+	+	-	+
Automatic Teller Machine	Number of Machine	+	+	-	+
Point of Sale Machine	Number of customer	+	+	-	+
Agent Banking subscribers	Number of customer	+	+	-	+

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSIONS OF RESULTS

In this chapter descriptive statistics as well as inferential statistics data outputs were presented analyzed and discussed accordingly. In addition to it, previous studies on the same or similar issue were also discussed against the research findings.

4.1. Empirical Analysis

4.2. Descriptive Statistics

Table 2 indicates that banks' profit increase from year to year with different magnitude. The minimum profit was registered in year 2014 while the maximum profit is registered in 2019. The average profit in 6 years time is Birr 19.8 Billion. There is also Birr 6.7 Billion profit standard deviation.

Provision held for loan asset increases in increasing rate from year to year. The minimum provision and maximum provision are held in year 2014 and 2019 Birr 3.5 and 11.7 Billion respectively. The average provision held in the period considered is Birr 6.7 Billion. There is also Provision standard deviation Birr 3.2 being observed.

Capital growth as a result of internal financial performance efficiency is increase an increasing rate in different magnitude. Taking 2014 capital as initial point the minimum and maximum capital increment value Birr 2.7 and 34 Billion are registered in year 2014 and 2017 respectively. The average capital increase in 6 year period is Birr 14 with standard deviation of Birr 12 Billion.

The banks' deposit increases in average of Birr 122 Billion in five year time. Great increment is observed in the year of 2017 value Birr 131 Billion. Birr 12 Billion was also observed as standard deviation.

The minimum growth for the case of card subscriber, Mobile subscriber, ATM machine and POS machine in terms of thousand are 565 (in 2018), 111 (in 2014), 367 (in 2015) and -753 (in 2019) respectively. The maximum growth for the case of card subscriber, Mobile subscriber, ATM machine and POS machine in terms of thousand are 4,283 (in 2019), 1,838 (in 2019), 1.8 (in 2019) and 4.8 (in 2016) respectively. The average growth of Mobile banking subscriber and card subscriber are .75million and 1.7million respectively. Whereas ATM and POS machine average

growth per year are 734 and 1,283 respectively. Standard deviation for card subscribers, mobile subscriber, ATM machine and POS machine are 1.4 Million, .63 Million, 573 and 1,937 respectively.

As at end of 2019 fiscal year, there were 110,586,629 card banking subscriber, 4,517,198 Mobile banking subscribers, 7,700 POS machine and 4,402 ATM machine exist in commercial banks of Ethiopia.

Table 2: Descriptive Statistics

Year	Profit	Provision	Capital	Deposit	CardSub	MobSub	ATMMach	PosMach
2014	10,487	3,470	2,733	51,647	815,082	110,676	373	118
2015	17,252	4,181	5,061	73,782	864,957	406,543	367	1,989
2016	18,966	5,552	7,375	76,036	1,273,062	757,810	455	4,784
2017	21,307	5,993	34,331	131,147	2,781,401	1,063,599	1,054	768
2018	19,981	9,795	5,003	162,141	564,823	340,143	388	794
2019	31,971	11,656	18,761	170,055	4,287,304	1,838,427	1,765	(753)
Total	119,964	40,647	73,265	664,808	10,586,629	4,517,198	4,402	7,700
Min	10,487	3,470	2,733	51,647	564,823	110,676	367	(753)
Max	31,971	11,656	34,331	170,055	4,287,304	1,838,427	1,765	4,784
Mean	19,994	6,774	12,211	110,801	1,764,438	752,866	734	1,283
S.Dev.	6,988	3,247	12,235	50,277	1,469,009	628,921	571	1,937

Source: National Bank of Ethiopia

4.3. Inferential Statistics

4.2.1. Model Selection

Models are a means of transform data in to information. Base for model selection is data type. Real and quality data end up false information due to model selection problem. In case of panel data models such as pooled ordinary least square, Fixed Effect and Random Effect Model of analysis are commonly appropriate. However, suitable model for the panel data is further tested and selected based on Hausman testing criteria and F statistical test.

4.2.2. Hausman Test

The null hypothesis for Hausman test is Random Effects Model is an appropriate model than the Fixed Effect Model and the alternative hypothesis is Fixed Effect Model is an appropriate model than the Random Effects Model. Based on Hausman test depicted in Table 3 Fixed Effect model

is appropriate for provision and deposit models whereas Random Effect is appropriate for profit and capital models used for this paper.

Table 3: Summary of Selected Model using Hausman Test

Model	Variable	Coefficients		(b-B) Difference	sqrt (diag (V _b - V _B)) S.E.	Chi ² (5) (b-B)'[(V _b - V _B) ⁽⁻¹⁾](b- B)	Prob>Chi ²	Selected or Appropriate Model
		(b)fe	(B) re					
Profit	cardsub	-756.3565	-2476.597	1720.24	.			Random Effect
	mobsub	3079.111	2924.273	154.8383	.			
	atmmach	8181043	2.13E+07	-1.31E+07	.	-117.20	0.9985	
	possub	867962.7	2812658	-1944696	.			
Provision	cardsub	-1636.725	-2414.288	777.5633	.			Fixed Effect
	mobsub	-451.6325	-48.83002	-402.803	.			
	atmmach	7623599	1.30E+07	-5334911	.	165.12	0.0000	
	possub	143009.9	927405.8	-784396	.			
Capital	cardsub	1953.538	1834.43	119.1076	645.5799			Random Effect
	mobsub	33587.36	30267.62	3319.738	1650.777	6.08	0.1077	
	atmmach	-2.54E+07	-2.01E+07	-5284630	3177720			
	possub	-3511004	-2661057	-849948	450492.9			
Deposit	cardsub	-18098.36	-29904.73	11806.37	.			Fixed Effect
	mobsub	34141.09	33379.79	761.2977	.			
	atmmach	4.52E+07	1.34E+08	-8.90E+07	.	579.75	0.0000	
	possub	-3588175	9601235	-1.32E+07	.			

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

(V_b-V_B is not positive definite)

4.2.3. Test of data Stationary

Data stationary is important to end up with good result which livelong as true. Unit Root is a common test for Panel data. Each and every variable should pass this Unit root test before data analysis being done. Based on this stationary test, all variable data except Agent Banking Subscriber Number (agentsub) have data stationary characteristic. The result also indicated that the data for each variable was stationary at 1% level of significance except for capital which has 10% level of significance. So, due to data stationary problem “agentsub” independent variable drops in the model. See Table 4 below.

Table 4: Unit Root test of all variables

Levin-Lin-Chu unit-root test

Ho: Panels contain unit roots

Ha: Panels are stationary

AR parameter: Common

Panel means: Included

Number of panels = 17

Number of periods = 6

Asymptotics: N/T \rightarrow 0

Time trend: Not included

ADF regressions: 1 lag

LR variance: Bartlett kernel, 5.00 lags average (chosen by LLC)

Variable	Statistics		P-Value
	Unadjusted t	Adjusted t	
Cardsub	-5.9581	-4.4034	0.0000***
Atmmach	-37.2823	-39.0354	0.0000***
possub	-15.0551	-11.2933	0.0000***
mobsub	-15.1828	-13.9576	0.0000***
agentsub	-	-	-
profit	-8.2051	-5.2843	0.0054***
provision	-33.9456	-36.6109	0.0000***
capital	-3.5779	-1.4265	0.0769*
deposit	-15.7159	-16.1167	0.0000***

* & *** significant at 10% and 1% level of significance

4.2.4. Testing for serial correlation

The other testing that should be made on panel is Serial Correlation Test. It is done to see panel correlation problem due to time. Serial correlation problem is observed in macro panels with long time series (over 20-30 years) but not problem in micro panels (with very few years). Serial correlation causes the standard errors of the coefficients to be smaller than they actually are and higher R-squared (Woodridge, 2010). So in this study serial correlation test is not required.

4.2.5. Panel Regression Analysis

4.2.5.1. Effect of E-banking on Deposit Mobilization in Commercial Banks

Table 5: Panel data analysis of banks' deposit

Deposit						
Fixed-effects (within) regression				Number of obs	=	102
Group variable: bank				Number of groups	=	17
R-sq:				Obs per group:		
Within = 0.5295				min	=	6
Between = 0.9294				avg	=	6.0
Overall = 0.5263				max	=	6
				F(4,81)	=	22.79
corr(u _i , Xb) = 0.5365				Prob > F	=	0.0000
deposit	Coef.	Std. Err.	T	P>t	[95% Conf. Interval]	
cardsub	-18098.36	3853.89	-4.70	0.0000***	-25766.40	-10430.33
mobsub	34141.09	9113.74	3.75	0.0000***	16007.60	52274.57
atmmach	45200000.00	13000000.00	3.48	0.0010***	19400000.00	71000000.00
possub	-3588175.00	1641319.00	-2.19	0.0320**	-6853885.00	-322466.00
_cons	5210000000.00	521000000.00	10.00	0.0000	4170000000.00	6240000000.00
sigma_u	12150000000.00					
sigma_e	4269000000.00					
rho	0.89012987 (fraction of variance due to u _i)					
F test that all u _i =0: F(16, 81) = 13.02			Prob > F = 0.0000			
&* Significant at 5% and 1% level of significance						

As shown in Table 5 above, from the bottom probability of F Statistics it tells that the pooled OLS regression model would not be appropriate model for the collected data. The intraclass correlation (rho or ρ) indicate that the variance due to difference across panel was 82.87% and it was an indication of fixed effect model was a good model due to the fact that rho approaches to one.

Regarding the model appropriateness that is whether the developed model was good or not to show the relationship between banks' deposit and other determinant factors, our model was a good model and at least one independent variable has significant effect on the regressor or the coefficients of explanatory variables used in the model all are not equal to zero (F(4,81) =22.79 or Prob > F = 0.0000).

From independent variables, Automatic Teller Machine (ATMMach) and number of Mobile banking Subscriber (MobSub) have statistically positivesignificant influence on banks' deposit

and the remaining Card Subscriber (CardSub) and number of Pos machine (PosSub) are statistically negative significant influence on the banks deposited.

The regression result shows that ATM has great deposit mobilization means for commercial banks in Ethiopia. A unit increase in ATM machine increases Birr 45.2 Million customer deposit per year at 1% level of significance. Next to ATM, Mobile banking has positive deposit mobilization mechanisms. A unit increase in mobile banking subscriber increases the banks deposit around Birr 34,141 per year at 1% level of significance. However, POS machines and Card banking subscriber depletes the bank deposit by Birr 3.6 Million and .018 Million per year per unit of POS machine and card banking subscriber respectively. The level of significance for Card and Pos Banking were 1% and 5% respectively. The constant coefficient of the model showed that without e-banking banks still generate customer deposits (Birr 5.2 Billion) per year. This result in general goes with the finding of (Gidion, 2016 and Samila, 2019) finding that ICT investment has significant effect on total bank deposit by customer). Besides, the result for the case of mobile banking is also tally with the finding of (Paul, 2018). However, this finding is inverse to (Ahmed, 2015) for case of Mobile and POS machines impact on liquidity.

4.2.5.2. Effect of E-banking on Capital Growth in Commercial Banks

The null hypothesis for Hausman test is Random Effects Model is an appropriate model than the Fixed Effect Model and the alternative hypothesis is Fixed Effect Model is an appropriate model than the Random Effects Model. As shown in Table 3 above p-value for the model test was greater than 0.05. Besides, “rho” was nil value due to there was no errors arise from individual banks. It means that the null hypothesis accepted and random effect model is appropriate.

Regarding the model appropriateness (see table 6) that is whether the developed model was good or not to show the relationship between banks capital and other determinant factors, our model was a good model and at least one independent variable has significant effect on the dependent variable banks' capital or there is no any variable that do nothing for the model. It is also confirmed by the Wald $\chi^2(4)=154.92, Prob > \chi^2 = 0.0000$ (Stephanie, NA).

This model is explained by three statically significant variables. Mobile banking is the major statistical significant for capital growth. Mobile banking contributes Birr 30,268 capital growth

from banks performance per year per additional mobile subscriber at 1% level of significance. POS banking and ATM banking are statically negative significance impact on capital internal growth. A unit increase in POS machine leads near to Birr 2.7 Million capital reduction per year at 1% level of significance. A unit increases of ATM machine decreases Birr 20.1 Million capital at 1% level of significance. The rest explanatory variable that has no statistical significant value for capital is card banking. It has positive relation with the capital model. Card banking has Birr 1,834 capital growth contribution per year per additional card subscriber. Banks could generate capital growth from internal efficiency Birr 254 million without e-banking service per year.

Table 6: Panel data analysis of banks' capital

Random-effects GLS regression				Number of obs = 102	
Group variable: bank				Number of groups = 17	
R-sq:				Obs per group:	
Within = 0.5306				min = 6	
Between = 0.8714				avg = 6.0	
Overall = 0.6150				max = 6	
Wald chi2(4) = 154.92				Prob > chi2 = 0.0000	
corr(u_i, X) = 0 (assumed)					
capital	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]
cardsub	1834.43	1593.48	1.15	0.2500	-1288.74 4957.60
mobsub	30267.62	3715.60	8.15	0.0000***	22985.17 37550.07
atmmach	-20100000.00	4833690.00	4.15	0.0000***	-29500000.00 -10600000.00
possub	-2661057.00	577239.10	4.61	0.0000***	-3792424.00 -1529689.00
_cons	254000000.00	194000000.00	1.31	0.1910	-127000000.00 635000000.00
sigma_u	0				
sigma_e	1905000000.00				
rho	0 (fraction of variance due to u_i)				

*** Significant 1% level of significance

4.2.5.3. Effect of E-banking on Volume of Asset Hold for Provision in Commercial Banks

As shown in Table7 below, from the bottom probability of F Statistics it tells that the pooled OLS regression model would not be appropriate model for the collected data. The intraclass correlation (rho or ρ) indicate that the variance due to difference across panel was 81.9 % and it was an indication of fixed effect model was a good model due to the fact that rho approaches to one.

Regarding the model appropriateness that is whether the developed model was good or not to show the relationship between banks provision and other explanatory variables, our model was a good model and at least one independent variable has significant effect on the dependent variable banks' provision or the coefficients explanatory variables used in the model all are not equal to zero ($F(4,81) = 7.28$ or $\text{Prob} > F = 0.0000$).

From all independent variables, only one variable number of pos machine has no statistically significant impact on the banks' provision while four explanatory variables have statistical significance on the bank's provisional allowance.

This model is explained by three statistical significant explanatory variables. Mobile banking is significant for provision at level of confidence 5% whereas card banking and ATM banking are significant at 1% level of confidence. Concerning magnitude and direction of the impact of e-banking on provision model, ATM has negative impact on provision reduction. A unit ATM machine increases creates Birr 7.6 Million provision allowance per year. Card banking and Mobile banking are decrease provision allowances in different magnitude. A unit increases in card banking subscriber decreases the banks provision by Birr 1,637 per year. A unit increases in mobile subscriber decreases the provision allowance by Birr 452 per year. Even if, it is statically insignificant, a unit increases in POS machine increase Provision allowance Birr 143,009 per year. Without considering the e-banking impact on provision banks has increase Birr 249 Million provision allowance per year. The finding on card banking and mobile banking is similar to the finding of (Muhamed, 2015&Madueme, 2010).

Table 7: Panel data analysis of banks' provision

Fixed-effects (within) regression	Number of obs =	102
Group variable: bank	Number of groups =	17
R-sq:	Obs per group:	
within = 0.5949	min =	6
Between = 0.9846	avg =	6.0
Overall = 0.6753	max =	6
	F(4,81) =	29.73
corr(u _i , Xb) = 0.6192	Prob > F =	0.0000

provision	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
cardsub	-1636.73	326.52	-5.01	0.0000***	-2286.41	-987.04
mobsb	-451.63	772.17	-0.58	0.5600*	-1988.01	1084.74
atmmach	7623599.00	1098614.00	6.94	0.0000***	5437702.00	9809497.00
possub	143009.90	139062.10	1.03	0.3070	-133680.20	419700.00
_cons	249000000.00	44100000.00	5.64	0.0000	161000000.00	336000000.00
sigma_u	769800000.00					
sigma_e	361700000.00					
rho	0.81912593 (fraction of variance due to u _i)					

F test that all u_i=0: F(16, 81) = 7.28 Prob > F = 0.0000

*&*** Significant at 10% and 1% level of significance

4.2.5.4. Effect of E-banking on Profits in Commercial Banks

The null hypothesis for Hausman test is Random Effects Model is an appropriate model than the Fixed Effect Model and the alternative hypothesis is Fixed Effect Model is an appropriate model than the Random Effects Model. As shown in Table 3 above p-value for the model test was greater than 0.05. In addition to it the “rho” shows “0” value due to error term within individuals’ summation is nil. These indicate that the null hypothesis for random effect model is appropriate.

Regarding the model appropriateness (see table 6) that is whether the developed model was good or not to show the relationship between banks capital and other determinant factors, our model was a good model and at least one independent variable has significant effect on the dependent variable banks’ capital or there is no any variable that do nothing for the model. It is also confirmed by the Wald chi2(4)=776.92, Prob > chi2 = 0.0000 (Stephanie, NA).

This model has three explanatory variables. Card banking, ATM banking and POS banking are statistically significant for the model at 1% level of confidence. In this model, ATM banking has great positive significance followed by POS banking and then mobile banking. Card banking has negative significant for profit. A unit increases in ATM machine increases Birr 21.3 Million

banks profit per year. A unit increases in POS machine increases Birr 2.8 Million banks profit per year. A unit increases in mobile subscribers increases Birr 2,924 banks profit per year but not statistically significant. However, a unit increases in card subscriber decreases Birr 2,477 banks profit per year. If everything is constant or without considering e-banking the bank could increase Birr 174 Million banks profit per year but it is statistically insignificant.

Profit is the end result measurement of any business firm. It also explained by different ratios such as ROA, ROC, ROI etc. These ratios have common nominator of net-profit. From the research data we could observe that banks capital which is the denominator of ROC increases from year to year. So, by proxy, profit performance and return from capital could exchange each other. Based on this assumption, the finding of Mobile banking impact on profit supported by (Hamington, 2013) similar to this research finding but not for card banking.

Table 8: Panel data analysis of banks' profit

Random-effects GLS regression	Number of obs	=	102
Group variable: bank	Number of groups	=	17
R-sq:	Obs per group:		
Within = 0.6911	min =		6
Between = 0.9917	avg =		6.0
Overall = 0.8890	max =		6
	Wald chi2(4)	=	776.92
corr(u_i, X) = 0 (assumed)	Prob > chi2	=	0.0000

profit	Coef.	Std. Err.	z	P>z	[95% Conf. Interval]	
cardsub	-2476.60	904.21	2.74	0.0060***	-4248.81	-704.38
mobsub	2924.27	2108.39	1.39	0.1650	-1208.09	7056.63
atmmach	21300000.00	2742835.00	7.75	0.0000***	15900000.00	26600000.00
possub	2812658.00	327549.30	8.59	0.0000***	2170674.00	3454643.00
_cons	174000000.00	110000000.00	1.58	0.1150	-42400000.00	390000000.00
sigma_u	0					
sigma_e	525200000.00					
rho	0(fraction of variance due to u_i)					

***significant at 1% level of significance

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

In this chapter, overall the research findings in compacted form, valuable conclusions and recommendation those drive from the study were discussed in respective order.

5.1. Summary of findings

Data that organize for this study indicated that e-banking service coverage increase from time to time. The average increase per year of ATM machine, POS machine, Card subscriber and mobile subscriber were 734,1,283, 1.8 Million and .75 Million respectively. As end of 2019 fiscal year, there were 4,402 ATM and 7,700 POS machines as well as 10.6 Million card subscribers and 4.5 Million Mobile subscribers in commercial banks of Ethiopia. Similarly, banks profit, capital growth, deposit growth was increasing an average of Birr 20 Billion, Birr 12 Billion and Birr 111 Billion while the asset quality decrease as a result of provision non-performing asset increases at average of 6.8 Billion in the period of 2014-2019 fiscal years.

Deposit growth was analyzed by Fixed Effect regression model. It was explained by statistically significant variables by all explanatory variables such as Mobile, ATM and POS banking at 1% level of significance except for POS banking (5% level of significance). ATM and Mobile banking increased Birr 45.2 Million and 34,141 banks deposit per year per additional machine and subscriber respectively. But, POS and card banking decrease banks deposit volume by Birr 3.6 Million and 18,098 per year per additional machine investment.

Capital growth was analyzed by Fixed Effect regression model. It was explained by statistically significant variables such as Mobile, ATM and POS banking at 1% level of significance. Card banking was not statically significant for capital. Card and Mobile banking increased Birr 1,834 and 30,267 respectively banks capital per year per additional subscriber. But, ATM and POS banking decrease banks capital by Birr 20.1 Million and 2.7 Million per year per additional machine investment.

According to Random Effect Generalized Least Square regression result, mobile banking was statistically significant on provision at 1% level of significance whereas card and ATM banking also significant for provision at 10% level of significance. However, POS banking was not statistically significant on provision. In case of magnitude and direction of effect of e-banking on

asset quality/provision, card and mobile banking increase the asset quality (reduce provision) Birr 1,637 and 451 respectively per year per additional subscriber whereas ATM and POS banking were increase provision by Birr 7.6 Million and .14 Million respectively per year per additional machine installation.

Random Effect generalized least square regression analysis on impact of ATM, POS, Card and Mobile banking on profit indicated that except card banking all e-banking contribute for profit maximization to commercial banks in Ethiopia. Concerning to magnitude of contribution of e-banking services to profit were, ATM banking increases Birr 21.3 Million profit per year per additional machine installation, POS banking increases Birr 2.8 Million profit per year per additional machine investment, mobile banking increases Birr 2,924 profit per year per additional mobile subscriber but there was Birr 2,476 profit reduction per year per additional card subscriber. In case of statistical significance, Mobile, POS and Card banking were significance at 1% level of confidence.

5.2. Conclusions

Each e-banking product has its advantages and disadvantages on financial performance of commercial banks exist in Ethiopia. The only full-of advantages is observed on Mobile banking solution or e-banking product. The followings are the major conclusions that drive from the research results.

- E- Banking services were expanding at increasing but inconsistent rate whereas banks profit, deposit and capital increases at increasing rate which are good for banks sustainability. Provision was also increase at increasing rate which is bad for banks performance perspective.
- ATM, POS and Card banking has statistically significant for profit maximization whereas card banking minimizes banks profit in Ethiopia. ATM banking relatively contributes more for profit maximization of banks in Ethiopia followed by POS and then mobile banking.
- ATM, Mobile and Card banking has statistically significant for banks asset quality improvement or degradation. POS banking was not statistically significant for banks provision in Ethiopia. Card banking followed by Mobile banking has impact on asset

quality improvement or decrease non-performing asset. However, ATM banking raises non-performing asset followed by POS banking for commercial banks in Ethiopia.

- Mobile, ATM and POS banking have statistically significant impact on internal growth of banks capital in commercial banks in Ethiopia. Mobile banking has relatively high positive impact on banks' capital growth followed by card banking. Nonetheless, ATM banking has great negative effect on internal capital growth followed by POS banking.
- Mobile, ATM, Card and POS banking have statistically significant impact on deposit mobilization of banks in commercial banks in Ethiopia. ATM banking has relatively high positive impact on banks' deposit mobilization followed by mobile banking. But, POS banking has great negative effect on deposit mobilization followed by card banking.
- Mobile banking has positive impact for profit maximization, non-performing asset reduction, internal capital growth and deposit mobilization for commercial banks exist in Ethiopia.
- Card banking has positive impact on non-performing asset reduction and internal capital growth for banks working in Ethiopia.
- ATM machine has positive impact on profit maximization and deposit mobilization for commercial banks working in Ethiopia.
- POS banking has positive impact on profit maximization performance for commercial banks in Ethiopia.
- ATM banking relatively generates more profit for the banks followed by POS banking and Mobile banking for Ethiopian banks perspective.
- Card banking relatively contribute more in non-performing asset volume reduction followed by Mobile banking in Ethiopian commercial bank perspective.
- Mobile banking also relatively better to generate internal capital growth followed by Card banking for commercial banks in Ethiopia.
- ATM banking generates relatively more commercial banks deposit in Ethiopia comparing to other e-banking products followed by Mobile banking.

5.3. Recommendations

According to the banks financial performance strategy banks shall use one or the combination of e-banking solutions. Based on the research findings the following are the recommendation forwarded by the researcher.

- Profit oriented banks shall work on in respective of additional ATM machine installation, additional POS machine installation and mobile banking service expansion and card banking service expansion in order to maximize profit for the bank.
- Liquidity oriented banks' should work on first on ATM banking followed by Mobile banking product in order generate more liquid asset to provide credit services to the customer.
- Banks that have great focus on increase asset quality must work on card banking first followed by Mobile banking e-banking products in order to decrease non-performing banks assets.
- A bank that has interest of increasing internal capital generation should work on, respective of the order, Mobile banking product and card banking product customer expansion. Mobile banking is statistical significant in this case.
- A bank that has interest on profit maximization, internal capital growth, deposit mobilization and non-performing asset reduction performances for a while shall invest on Mobile banking products.

5.4. Further study

- E-banking product base cost benefit analysis considering the cost share of IT investment per product shall be done in order to see further impact on banks financial performances in perspective of CAMELS which is the best financial institution performance rating criteria.
- Comparative study on Banking Performance (before and after IT support) shall be done using resource-based theory in order to identify financial performance change due to investment on IT solutions.

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