



**ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
FACULTY OF BUSINESS AND ECONOMICS**

**The Effects of E-Banking on Bank Performance: the Case of
selected Ethiopian Commercial Banks**

A Research Project Submitted in Partial Fulfillment of the
Requirements for the Award of
Master of Business Administration (MBA)

BY
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June 2017
Addis Ababa,
Ethiopia

DECLARATION

I, the undersigned, declare that this study entitled “**The Effects of E-Banking on Bank Performance: The Case of selected Ethiopian Commercial Banks**” is my original work and has not been presented for a degree in any other university, and that all sources of materials used for the study have been duly acknowledged.

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CERTIFICATE

This is to certify that this study, **“The Effects of E-Banking on Bank Performance: The Case of selected Ethiopian Commercial Banks”**, undertaken by Besufkad Gebre for the partial fulfillment of Master’s of Business Administration [MBA] at Addis Ababa University, is an original work and not submitted earlier for any degree either at this University or any other University.

Research Advisor: Dr. Yitbarek Takele

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SCHOOL OF GRADUATE STUDIES

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Abstract

In spite of the conspicuous use of the e-banking as a delivery channel in banks', there is a relative dearth of empirical studies that provide a quantitative analysis of the effect of the e-banking service on banks' financial performance. Because of this fact, this paper fills the gap. Since, study is aimed to test the effect of e-banking on the profitability of commercial banks in Ethiopia during the period 2011-2015. The study sample consists of six commercial banks in Ethiopia. Percentages are used to test the effect on profitability; these percentages are Return on Assets and Return on Equity as profitability measures. Other used as independent variables are: ATM, Debit cards, and POS. Regression analysis is used to test the effect of e-banking services on the Profit. The regression analysis showed that there is positive effect of e-banking services on the profitability of commercial banks in terms of ROA, and ROE.

Keywords: *Electronic banking, ROA, ROE, ATM, POS, Debit cards*

Acknowledgments

First and foremost, I would like to thank the Almighty God to give me the courage through his endless love and blessings that helped me to finalizing the study. And I would like to thank his mother Saint Mary. She pray, bless, protect and intercede for us.

I would like to express my deepest and heartfelt gratitude to my research advisor Dr. YitbarekTakele, who tirelessly provided me all the necessary advice, guidance and comments throughout this study. My deepest gratitude goes to my family who are assisted me to accomplish this work. Last but not least, my great thanks go to all my friends and coworkers those who provided me all the necessary assistance when doing my thesis.

Thank you all!!!

Acronyms & Abbreviations

AIB:	Awash International Bank S.C.
ATM:	Automated Teller Machine
BLUE:	Best Linear Unbiased Estimator
BOA:	Bank of Abyssinia S.C
CAP:	Capital adequacy
CBE:	Commercial Bank of Ethiopia
CLRM:	Classical Linear Regression Model
DB:	Dashen Bank S.C
DCS:	Debit Cards
DW:	Durbin-Watson
FEM:	Fixed Effect Model
HP:	Hypotheses
JB:	Jarque-Bera
LIQ:	Liquidity Coverage Ratio
NBE:	National Bank of Ethiopia
NIB:	Nib International Bank S.C
OLS:	Ordinary Least Square
REM:	Random Effect Model
ROA:	Return on Assets
ROE:	Return on Equity
UB:	United Bank S.C
WB:	Wegagen Bank S.C

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Chapter One: Introduction

1.1. Background of the Study

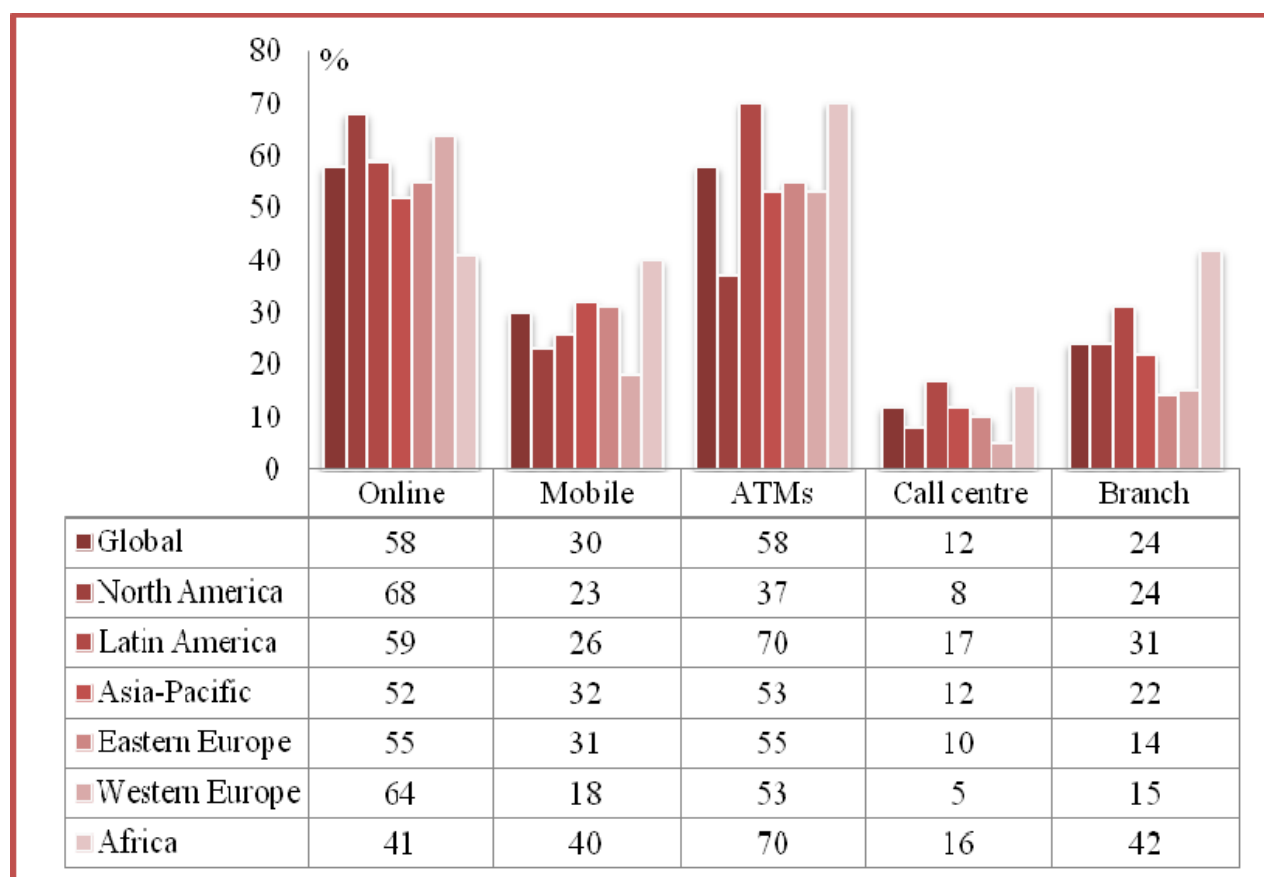
The last decade of the 20th century witnessed profound technological changes among which is the advent of electronic commerce, or the exchange of products and services and payments via telecommunication systems (Kalakota & Whinston, 1997).consequently according to Gunasekaran and Love (1999) most industries have been influenced, in one way or another, by this promising new technology. In addition to that according toJyotiVijet al, (2014) the new millennium has opened a plethora of opportunities in information technology and has made tremendous impact in Banking. The business environment globally has changed and it has been characterized by stiff competition among the players and the banking industry is no exception.

All over the world, there is an increasing demand for the services of E -banking, while some banks have been able meet the required needs for the introduction of E-banking in their host countries; it has not worked so well in other places. As Emor (2002) noted, although countries like USA, Canada and other leading European countries stand tall in this development, other success stories have also been recorded in less developed countries like India, Malaysia, South Africa etc. despite the perceived hampering difficulties in other less developed countries, some banks have been successful in countries like Ghana, Nigeria, Kenya and many others. The contention expressed by Regan and Macaluso, (2000) indicated that the basic factor for a successful implementation of E-banking is to focus on the characteristics of the country in question.

While financial institutions took steps to implement e-banking services in the mid-1990s, many consumers were hesitant to conduct monetary transactions over the web. It took widespread adoption ofelectronic commerce, based on trailblazing companies such as America Online, Amazon.com and eBay, to make the idea of paying for items online widespread. By 2000, 80 percent of U.S. banks offered e-banking. Customer use grew slowly. In the same year, Bank of America became the first bank to top 3 million online banking customers, more than 20 percent of its customer base. In comparison, larger national institutions, such as Citigroup claimed 2.2 million online relationships globally, while J.P. Morgan Chase estimated it had more than

750,000 online banking customers. According to a 2014 EY Global Consumer Banking Survey, the Internet is the preferred banking method for 55% of respondents globally for paying bills or making transfer and for 50% for balance inquiry, while branch banking is favored for deposits, advice and sales (Keivani et al. 2015).

Figure 1.1. Channel use (% who use channel at special frequency)



Source: EY (2014) Global Consumer Banking Survey

Despite the rapid growth and practice of e-banking, globally, several empirical studies exist on e-banking and bank performance. However, some studies carried out, though offered useful guide for e-banking strategic decisions, provide empirical mixed evidences. For example, Furst, Lang and Nolle (2000), Hasan, Maccario and Zazzara (2002), Yibin (2003), Hasan, Zazzara and Ciciretti (2005), Hernado and Nieto (2006), De Young, Lang and Nolle (2007) and Ciciretti, Hansan and Zazzara, (2009) reported positive impact; Delgado, Hernando and Nieto (2004) and AL-Samadi et al. (2011) observed a negative impact while Eglund et al. (1998) observed no significant impact.

In developing countries, the lack of electronic banking infrastructure block impacts of the expected cost effectiveness and profitability. In some developing countries, it is not available strong effects on the profitability of electronic banking activities because of inadequate information technology infrastructure of the branch and ATM network are limited.

The case is also real for online banking activities. Internet infrastructure based on relatively old technology blocks the achievement of expected performance of banks in developing countries (Alam et al., 2007, Gutu 2014). The use of technology has several advantages ranging from regulation, operational costs; accessibility of services will accrue to the institution and customers that adopt the technology that will in turn influence the firm's financial performance (Nzau, 2013). The purpose of this paper is to empirically examine the effect of e-banking and bank performance in selected commercial Banks in Ethiopia.

1.2 E-Banking History in Ethiopia

The evolution of the e-banking can be traced to the early 1970s in the world. Banks began to look at e-banking as a means to replace some of their traditional branch functions, for two reasons. Firstly, branches were very expensive to set up and maintain due to the large overheads associated with them. Secondly, e-banking products/services like ATM and electronic funds transfer were a source of differentiation for banks that utilized them. Being in a fiercely competitive industry, the ability of banks to differentiate themselves on the basis of price is limited. It is evident that banks and other financial institutions in developed and developing countries are embracing e-banking. As technology evolves, different kinds of electronic banking systems emerge, each bringing a new dimension to the interaction between user and bank. They include Automated Teller Machine (ATM), mobile and Internet (online) banking, electronic funds transfer, direct bill payments and credit card (Gikandi and Bloor, 2010; Liaoa and Cheung, 2002).

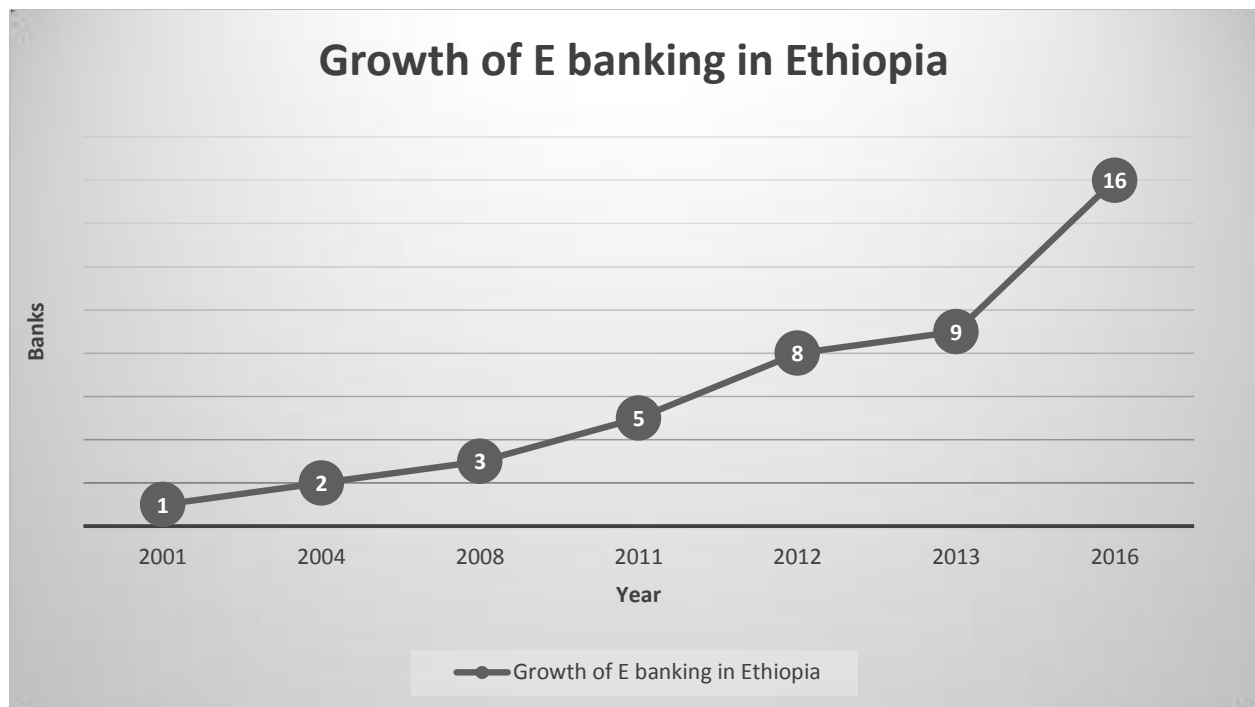
The Ethiopian banking system is one of the most underdeveloped compared to the rest of the world. In Ethiopia cash is still the most dominant medium of exchange and electronic banking is not well known, let alone used for transacting banking business. All banks in Ethiopia are too late to move with technological advancement and they should clearly chart out the time schedule

for their integration and technological advancement. But unlike other E banking delivery channels all most all banks has installed ATMs at convenient locations for their cardholders. Currently, debit service only gives for Visa and master cards and clients of respective banks can withdraw cash and can buy goods and services by using the debit card. (Worku, 2010).

Although, Commercial Bank of Ethiopia, introduced ATM service for local users in 2001 with its fleet of eight ATMs located in Addis Ababa. Moreover, CBE has had Visa membership since November 14, 2005. However, due to lack of appropriate infrastructure it failed to reap the fruit of its membership. Despite, being the pioneer in introducing ATM based payment system and acquired Visa membership, CBE lagged behind Dashen Bank, which worked aggressively to maintain its lead in electronic payment systems. Dashen bank, a forerunner in introducing e-banking in Ethiopia, has installed ATMs at convenient locations for its own cardholders.

The number of banks which deliver E-banking service is increase gradually up to 2011 and reaches 4. Surprisingly, on June 2012, 3 banks enter in to the market with consortium which makes the provider of E-banking service to 7. And at the end of 2013, Berhan international bank joined group and makes the provider of E-banking service in to 8.now all commercial banks start e-banking service for their customers using et-swith solution.

Dawit (2016) regarding ET Switch, a centralized switch system which plans to integrate all real-time and online payment systems in Ethiopia, which started by connecting all the Automated Teller Machines (ATMs), has announced that it has completed transaction valued at 1,175,089,410 birr since its launch May 2016 although challenged by high transaction decline rate of 40 percent per month mainly caused by the connection failure and system breakage in its member banks.



Source: NBE website and Et-switch website

Apart that, e-banking applications represent a security challenge as they highly depend on critical ICT systems that create vulnerabilities in financial institutions, businesses and potentially harm banking customers. It is imperative for banks to understand and address security concerns in order to leverage the potentials of ICTs in delivering E-banking applications. In the deployment of E-banking application, attention should be drawn to the prevention of cybercrime (i.e. the use of ICTs by individuals to commit fraud and other crimes against banking transactions) (ITU4D, 2006).

1.3. Statement of the Problem

It is doubtful that electronicbased banking provides relatively high return,lowoperational cost and increase profitability of the bank. Khrawish and Al-Sa'di (2011), Al-Samadi and Al-Wabal (2011), and Gutu (2014) findings show that the impact on the profitability of some electronic banking is negative. Al-Samadi and Al-Wabal (2011) determined that the impact of the negative performance of electronic banking operations in Jordan, since, customers still depending on traditional distribution channels.

In developing countries, the lack of electronic banking infrastructure block impacts of the expected cost effectiveness and profitability. In some developing countries, it is not available strong effects on the profitability of electronic banking activities because of inadequate information technology infrastructure of the branch and ATM network are limited. The case is also real for online banking activities. Internet infrastructure based on relatively old technology blocks the achievement of expected performance of banks in developing countries (Alam et al., 2007, Gutu 2014).

On the other hand, recent studies one banking and performance of the banks in African countries that relatively lower level of development. For example, Abaenew et al. (2013) and Hassan et al. (2013) made studies on Nigeria and Adua and Kingoo (2012) and Nguyen Gakur Connection (2013) made studies on Kenya The electronic banking activities increase profitability on banks.

Previous studies in Ethiopian e-business focus on the assessment study and the correlation between e-banking and customer satisfaction (Assefa 2013). Likewise, Gemechu (2014); Gardachew (2010) evaluated the adoption of e-banking in the context of banks perception, in addition, one research found on the effect of e-banking on performance (Tilahun2015) focus only ATM,debt card and POS.

According to Adua and Kingoo (2012) there are a number of empirical studies concerning the effect of adoption of e- banking on the performance of banks, some scholars observed positive impact, some observed negative while other researchers have drawn mixed conclusions.

From the above paragraph clearly seen, there is mixed evidence about e-banking on banks' performance that it becomes imperative to carry out a study in Ethiopian context whether e banking has effect on financial performance of commercial banks. It is therefore, important for bankers, bank regulators, supervisors and researchers to understand e-banking effects the performance of banks. Hence, the researchers' main purpose is to fill this significant gap by providing systematic analysis of electronic banks on the performance of Ethiopian commercial banks.

1.4 Objectives of the Study

1.4.1 General Objective

The general objective of this study is effect of e-banking and bank performance of commercial banks in Ethiopia, focusing on its contribution on return on equity and return on asset.

1.4.2. Specific Objective

The specific objectives of the study are:-

- To examine the effect of ATM on return on Equity of commercial banks in Ethiopia.
- To examine the effect of POS on return on Equity of commercial banks in Ethiopia.
- To examine the effect of Debit cards on return on Equity of commercial banks in Ethiopia.
- To study the effect of ATM on return on Asset of commercial banks in Ethiopia.
- To study the effect of POS on return on Asset of commercial banks in Ethiopia.
- To study the effect of Debit cards on return on Asset of commercial banks in Ethiopia.

1.5 Research Hypothesis

Based on the research objective and thorough analysis of theoretical and empirical literatures, the researcher has developed and tested the following hypothesis:

Hypothesis one: ATM has a positive relationship with return on Equity of commercial banks in Ethiopia.

Hypothesis two: POS has a positive relationship with return on Equity of commercial banks in Ethiopia.

Hypothesis three: Bank debt card has a positive relationship with return on Equity of commercial banks in Ethiopia.

Hypothesis four: ATM has a positive relationship with return on Asset of commercial banks in Ethiopia.

Hypothesis five: POS has a positive relationship with return on Asset of commercial banks in Ethiopia.

Hypothesis six: Bank debt card has a positive relationship with return on Asset of commercial banks in Ethiopia.

1.6. Scope and Limitation

The scope of the study extends up to examining the effects of E-banking on Bank performance. As it is well-known, most commercial Banks are started E-banking recently and if sample of population want to be increased then the frequency of observation will decreased. This may create difficulties to find out the true relation between dependent variable and independent variables. In order to make generalization from sample to population, and to increase number of observation of the study, a combination of the maximum number sample of population (commercial bank) and frequency of observation (Year of operation) were taken into account. As a result, the researcher used 5 years data by taking sample of 6(six) commercial banks that have been operating 2001 to 2015 while deposit mobilization activity in Ethiopia is made by the entire seventeen commercial banks.

1.7 Significance of the Study

The finding of the study will be of great importance to executives of commercial banks in Ethiopia as they will understand the effect of electronic banking on profitability of commercial banks in Ethiopia, this will assist them in making decision on whether to adopt electronic banking or not and the expected results of electronic banking adoption to their banks profitability.

The study finding will enlighten the policy makers in the banking industry on the expected effect of electronic banking on banks profitability; this will assist them in designing appropriate policy for electronic banking adoption by commercial banking in Ethiopia.

The study will be of great importance to future scholars and academicians as it will form basis for future research as well as providing literature for future studies on electronic banking.

1.8 Organization of the Study

This research paper was organized in five chapters. Following this, Chapter two describes the review of related literatures. Chapter three provide detail description of the methodology. Chapter four contains data presentation, analysis and interpretation. Finally, the last chapter will concludes the total work of the research and gives relevant recommendations based on the findings.

Chapter Two: Review of Related Literature

Introduction

This chapter reviews the existing literature on electronic banking on performance of commercial banks. In specific the chapter reviews that theoretical review where various theories on electronic banking are reviewed, empirical review where empirical studies done on effects of electronic banking on banks performance are reviewed.

2.1 Theoretical Review

2.1.1 Definition of E- Banking

A common definition for electronic banking comes from the Basel Committee on Banking Supervision: “e-banking includes the provision of retail and small value banking products and services through electronic channels as well as large vale electronic payments and other wholesale banking services delivered electronically” (BCBS, 1998).

Electronic banking can be defined as the deployment of banking services and products over electronic and communication networks directly to customers (Singh & Malhotra, 2004). Vilattes (1997) defines E-banking as a distance banking that not only handles the flow of information between customers’ “living spaces” (e.g. homes, offices, etc.) and the physical facilities of the bank, but also deals with solicitation, sales, distribution and access to services, all without requiring the customer and the financial institution representative to be in the same physical place at the same time. In addition Mols (1998), electronic banking is the automated delivery of new and traditional banking products and services directly to customers through electronic medium. This system allows customers to access their accounts, transact business, make enquiries and have prompt responses from banks.

E-Banking is defined as using electronic devices like internet, wireless connection networks, ATM, phone and cell phone in banking services. These services were parts of providing currency for and economic system for the country (Laford & Li, 2005).

The more we are going to the higher levels of E- Banking, the less manual works will be, the more computer systematize, the more networks available, the less time restriction, and ultimately the more secure banking system will be. Services are done by internet network that is popular for its security. On the other hand, E- Banking is the use of communication in exchanging currency in banking system (Godarzi & Zobaidi 1999). In other definition E- Banking is a service producer with low costs by the help of electronic channels. These productions and services can be: account bill, loan, deposit management, E-payment, E-money. E- Banking is using internet and or intranet that are accessible for the people. Definitions such as digital money, E- check, E- money, E- signature are new phenomena that their origin returns to E-Banking (bid abadi & alahyary 2003). Accounting, exchanging, receiving bill, and paying bill are given to the clients a list with time order. E- Banking has a lot of benefits like increasing clients, and decreasing bank costs. Moreover, by using E- Banking it is easy to the bank to do their services faster and with more security. They can also increase their shareholders.

Claessens et al (2001) mention the leapfrogging opportunities e-finance provides to emerging countries. Despite weak financial systems and structures, these countries may benefit from their access to the latest technology when building up their financial intermediation infrastructure.

“E-finance can allow countries to establish a financial system without first building a fully functioning financial infrastructure. Because e-finance is much cheaper, since it lowers processing costs for providers and search and switching costs for consumers, providers can market financial services involving smaller transactions to lower-income borrowers, even in remote areas. To further this, government’s main role will be to enhance the enabling environment.”

It is stated that the most pressing policy issues will involve the enabling environment for e-finance; setting regulatory and other frameworks for contract enforcement, for information and privacy, and for telecommunications, security, and public infrastructure for electronic transactions. Claessens et al (2002) further contribute to leapfrogging advantage of emerging markets by suggesting that e-finance can benefit financial sector development of emerging

countries by lowering costs, increasing the breadth and quality and widening access to financial services.

2.2. The Concept of E-Banking

Today, an individual's ability to pay for goods and services is simply reflected in accounting records of his or her bank. Thus, it is important to appreciate at the outset that money as it is defined today is just simply information, which can be electronically transmitted to facilitate economic transaction. It is this new definition of money, which has resulted in the electronic revolution of financial institution (Balachandher, 2001).

According to Marsh (2005) e-banking is having 24 hour access to banking operations such as through an Automated Teller Machine (ATM) with Personal Identification Number (PIN) or making a direct deposit into checking or saving accounts. Additionally, Insely& Fleming (2000) argue that —e-banking is a general term for a process by which a customer may conveniently perform banking transactions electronically without visiting a brick and mortar institution.

Bhattacharjee (2001) expands this definition by stating that e-banking is as an integrated system that can provide customers flexible, convenient and inexpensive platform with integrated services of online personal banking products including online checking and saving accounts, money market accounts, certificate of deposit, credit cards, home equity loan, home mortgage, insurance, investment services, portfolio management and other related financial services. Thus the electronic platform eliminates the traditional way of banking whereby customers had no option than to walk to a bank to perform transactions. It means that with e-banking the customer can conduct his/her transactions anytime, anywhere without having to walk to a bank.

2.3. Economic Rationale of E-Banking

Innovation in Technology has distorted the traditional retail banking business model by making it possible for banks to break their traditional value creation chain so as to allow the production and distribution of financial services to be separated into different businesses. Thus, for example, primarily Internet banks distribute insurance and securities as well as banking products, but not all the products they distribute are produced by their group (Delgado et al 2012). However, the main economic argument for diffusion of adopting the Internet as a delivery channel is based on

the expected reduction in overhead expenses made possible by reducing and ultimately eliminating physical branches and their associated costs (e.g. staff, marketing and rent).

As stated by DeYoung (2012), and Delgado et al (2013) the Internet delivery channel may generate scale economies in excess of those available to traditional distribution channels. Besides them, Haq (2013) also states that bank exists because of their ability to achieve economies of scale in minimizing asymmetry of information between savers and borrowers. The unit costs of Internet banking fall more rapidly than those of traditional banks as output increases as a result of balance sheet growth. In this context, DeYoung (2012) refer to the Internet banking as a "process innovation that functions mainly as a substitute for physical branches for delivering banking services.

2.4. Technology- Organization- Environment (TOE) Framework

TOE framework was proposed by Tornatzky and Fleischer; it is designed for studying the likelihood of adoption success of technology innovations. This framework is a comprehensive and well received framework in the context of innovation adoption by organizations and has been used in many studies (Salwani, et al, & Ellis 2009; Chang et al 2007, Zhu & Kraemer 2006). According to Tornatzky and Fleischer (1990), technology adoption within an organization is influenced by factors pertaining to the technological context, the organizational context, and the external environment. Typical characteristics of technology considered in technology adoption studies are based on the assumption of Roger's diffusion of innovation (Rogers 2003), Which include relative advantages (perceived benefits), and relative disadvantages (perceived risks).

While the organizational factor refers to the organization's characteristics that influence its ability to adopt and use of E-banking system. The environmental factor refers to the external environment in which an organization operates and its condition for supporting the development of E-banking services. For each context, various factors have been identified from the literature but only those that are considered relevant for E-banking adoption are included in the framework. Details of factors considered in this study are discussed below.

2.4.1 Technological Factors

It appears that there is a lack of consensus on what factors belong to this context. For example, one study (Salwani 2009) includes technology competence covering existing technology infrastructure and skills to utilize the technology in this context, while other studies (Ellias 2009 & Chang 2007) consider some relevant characteristics of technology. To avoid overlapping between technology and organizational contexts, researcher chooses two basic factors related to technology competence, which have relevant to the organizational factors, i.e perceived benefits and perceived risks are considered in this study from the technological factors.

1. Perceived benefits: - Perceived benefits of E-banking cover both direct and indirect benefits for the banking industry as well as for the consumers. Direct benefits include the savings on operational cost, improved organizational functionality, productivity gain, improved efficiency and increased profitability. Indirect benefits include the opportunity or intangible benefits such as improved customer's satisfaction through improved services, improved banking experience and fulfillment of their changing needs and lifestyle (Lu et al. 2005; Kuan & Chau 2001 & Iacovou 1995)

2. Perceived risks: - One of the important risks faced by banking institutions in offering E-banking services is the customers' resistance to use the services which significantly hinder the growth of E-banking (Zhao et al. 2008 & Laforet 2005). Issues related to security have always been a concern when dealing with technologies related to online transactions such as E-banking (Chang 2007 & Rogers 2003). Therefore, the perception of the risks regarding E-banking is expected to influence its adoption and further growth.

2.4.2. Organizational Factors

Organizations are different in their preference to adopt technological innovation (Iacovou 1995 & Grover 1993) influenced by a number of factors, like firm size, top management support and financial and human resources. In the framework for this study, researcher uses one basic organizational factor as discussed below.

Financial and human resources: - Financial resources are an important factor in facilitating innovation adoption for any organization and they are often correlated with the firm size (Kuan

2001 & Iacovou 1995). Therefore, it is expected that the availability of financial resources within the adopting firms is important for E-banking practice. These resources enable banking institutions to obtain human related resources including the required skills and expertise to develop and support provision of E-banking services.

2.4.3 Environmental Factors

Researcher identified factors related to the environmental context that play a crucial role in technology adoption and some factors in this category are arguably more influential than others, especially when countries under study have an authoritative government leadership. The Four factors relevant for E-banking adoptions included in this study are:-

1. Legal Frameworks: - The existence and maturity of E-commerce legal frameworks within a country influence the diffusion of online transactions including E-banking as demonstrated in various studies (Tan & Wu 2002; Martinson & Trappey 2001).

2. The National ICT infrastructure: - 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, E-banking adoption and use cannot do well (Efendioghu 2004 & Scupola 2003).

3. Competitive pressure: - Competitive pressure can strongly influence any bank to develop and adopt E-banking initiatives and it may affect the bank's perception towards E-banking system. As implied in previous studies (Quaddus & Hofmeyer 2007; Gibbs, Kraemer & Dedrick 2003).

4. Government Support: - 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 2001 & Iacovou 1995)

2.5. Technology Acceptance Model

Technology Acceptance Model, developed by Davis (1989), is one of the most influential research models in studies of the determinants of information systems and information technology acceptance to predict intention to use and acceptance of information systems and information technology by individuals. Technology Acceptance Model has received considerable attention of researchers in the information system field over the past decade.

In the Technology Acceptance Model, there are two determinants including perceived ease of use and perceived usefulness. Perceived usefulness is the degree to which an individual believes that using a particular information system or information technology would enhance his or her job or life performance. Perceived ease of use is the degree to which a person believes that using a particular information system or information technology would be free of effort.

Perceived ease of use and perceived usefulness positively affect the attitudes toward an information system; and further, positively affect the individuals' intentions to use and the acceptance of the information system. In addition, perceived ease of use positively affects the perceived usefulness, and both of perceived ease of use and perceived usefulness are influenced by external variable.

2.6. Innovation Diffusion Theory

According to Dillon and Morris (1996); Rogers (1983 & 2003), the factors which influence the diffusion of an innovation include; relative advantage (the extent to which a technology offers improvements over currently available tools), compatibility (its consistency with social practices and norms among its users), complexity (its ease of use or learning), trial ability (the opportunity to try an innovation before committing to use it), and observability (the extent to which the technology's outputs and its gains are clear to see). These elements are not mutually exclusive thus unable to predict either the extent or the rate of innovation diffusion. Moore and Benbasat (1991) built on the work of Roger (1983), amongst others Tornatsky and Klein (1982) and Brancheau and Wetherbe (1990) and expanded the array of innovation characteristics to seven.

Three of the seven innovation characteristics are directly borrowed from Rogers: relative advantage, compatibility, and trial ability. Specifically, the theory begins to describe the innovation- decision process within organizations, but not to the level of addressing whether and how the characteristics of an innovation interact to affect its adoption within organizations, or whether organizational type, size, or industry affect adoption. In addition, while there is an innovation- decision process described for individuals and within organizations, there is no description of how the variables interact when innovations are diffused across organizations.

2.8. Type of Electronic Banking

Electronic banking consists of the following: mobile banking, internet banking, telephone banking, electronic card etc.

2.8.1 Mobile Banking

Mobile banking involves the use of mobile phone for settlement of financial transactions. It supports person to person transfers with immediate availability of funds for the beneficiary. Mobile payments use the card infrastructure for movement of payment instructions as well as secure Short Message Service (SMS) messaging for confirmation of receipt to the beneficiary. Mobile banking is meant for low value transactions where speed of completing the transaction is a key. The services covered under this product include account enquiry, funds transfer, recharge phones, changing of passwords and bill payment which are offered by few institution (Sathye, 1999).

2.8.2. Internet Banking

Internet banking involves conducting banking transactions such as account enquiry printing of statement of account; funds transfer payments for goods and services, etc on the internet (WorldWide Web) using electronic tools such as the computer without visiting the banking hall. E-commerce is greatly facilitated by internet banking and is mostly used to effect payment. Internet banking also uses the electronic card infrastructure for executing payment instructions and for final settlement of goods and service over the internet between the merchant and the customer currently the most common internet payments are for consumer bills and purchase of air ticket through the websites of the merchants (Littler, 2006).

2.8.3. Telephone Banking

These are banking services which a customer of a financial institution can access a telephone line as a link to the financial institution's computer center. Services rendered through telephone banking include account balance funds transfer, change of pin, and recharge phones and bills payment (James, 2009).

2.8.4. Electronic Card

An electronic card is a physical plastic card that uniquely identifies the holder and can be used for financial transactions on the internet. For instance, Automated Teller Machine (ATM) and Point-of Sales (PoS) terminal are used to authorize payment to the merchant or seller (James, 2009). The various types of electronic cards include debt, credit cards; releasable cards require visiting banks for replenishment. Debit cards are linked to local bank accounts and offer immediate confirmation of payment. Credit cards can be used to link a customer to a credit line and can also be used for accessing local and international networks and are widely accepted in most countries. The underlying infrastructure and operational rules are often provided by global trusted schemes (such as visa and master card) in addition to local lines (James, 2009).

2.8.5. Automated Teller Machine (ATM)

Automated Teller Machine (ATM) is a device, which offers a range of services to users that are authorized by using a PIN-code. From a cash ATM, user is able to make payments, withdraw money or view account information (Myllynen, 2009).

ATMs have reduced costs per transaction to almost one-fourth as compared to almost the branches. ATMs support a variety of transactions such as cash withdrawal, cash deposits and placement of service requests, including the request for a new cheque book. New technology has facilitated the installation of ATMs in shopping malls or busy commercial localities and has further reduced the transaction and operation costs for banks (Sambamuthy et al., 2010).

The ATMs were one of the first ICT technologies to be used by banks and it has remained one of the most successful. The ATM is a computerized telecommunication device that provides bank customers with self-service access to their financial accounts. A prototype was first created in 1939, a modern ATM was patented in 1966, an ATM was installed in Barclays Bank in London in 1967 and the United States started productizing ATMs in 1968 (Bellis, 2010).

According to Koltveit et al. 2000, alternate delivery channels such as ATMs, Telephone Interactive Voice Response systems, and online banking are mature channels, but advance in ICT permit opportunities for enhancements even in these established technologies. Current popular alternate delivery channel technologies include service such as short message service (SMS) banking, text alerts, bill pay, automated clearinghouse, electronic payments, mobile banking, e-mail alerts and notifications, and online banking. These technologies are all relatively recent ICT enabled strategies that enhance performance.

As stated by Morsi (1996) banks are adding ATM functions such as on line loan applications, distribution of statements, dispensing of foreign currency, purchase of traveler's checks, and check cashing to attract customers.

2.8.6. Point of Sale (POS)

According to Malak (2007) cited in Ayana (2014) POS system allows consumers to pay for retail purchase with a check card, a new name for debit card. This card looks like a credit card but with a significant difference. The money for the purchase is transferred immediately from account to debit card holder to the store's account.

2.9. Empirical Literature

Previous empirical studies it is rational that whether or not e-banking system proves correct and whether banks capture benefits of this new technology based banking will ultimately depend on their assessment of the profitability. If banks find that with adoption of e-banking system their financial performance improves, then there will have a positive impact on the investment in such technology based banking services. There exist a number of empirical studies concerning the impact of adoption of e- banking on the performance. Some scholars observed positive impact, some observed negative while other researchers have drawn mixed conclusions.

Positive conclusions: using a sample of 72 Spanish commercial banks and data over a period of 1994–2002, Hernando and Nieto (2007) found that impact of adoption of e-banking system takes time to contribute to performance of banks and for the sample banks authors found significant

positive impact, after three years of adoption of e-banking system, of a transactional web site on financial profitability, measured in terms of Return on Equity (ROE) and Return on Assets (ROA), of the banks. In the context of Turkey, using data of 1996–2005 on thirteen banks Onay et al. (2008) examined the effects of internet banking on the financial performance of banks. In addition to employing the approach of Hernando and Nieto (2007), they have used specific and macroeconomic control variables in the analysis and found that e-banking has a positive impact on banks' ROE with a time lag of two years.

Rahman (2007) studied impact of innovative technology on the profitability of the banks operating in Bangladesh and found that technology adopted banks experienced improved performance as they gain maturity. The limitation of this study is that author only showed the performance changes overtime but did not explained whether such changes are significant or not. Aduda and Kingoo (2012) established a positive relationship between e-banking and financial performance of banks by using Pearson Product-Moment Correlation Coefficient test. Using data of twenty seven banks over the period of 2006 to 2010, authors found that e-banking has strong and significant marginal effects on returns on asset in the banks operating in Kenya. Karimzadeh et al. (2014) investigated the impact of e-banking on the profitability of a bank in Iran. By using quarterly data over the period of 2004–2012, they found that expansion of e-banking has significant positive association to the profitability, measured in terms of ROA, of the sample bank. Using a sample of 10 banks' data over the period of 2002 to 2012, Rauf and Qiang (2014) measured the impact of e-banking on the performance of Pakistani commercial banks where the performance was measured in terms of Return on Assets, Return on equity and interest margin. Their empirical investigation revealed that e-banking has significant positive impact on margin, ROA and ROE of the recent adopters whereas for the early adopters significant positive impact on ROE and Margin but slightly on ROA. On the basis of findings, they conclude that banks can consider e-banking as a cost saving effective strategy to compete with the domestic and foreign banks given a well-managed monitoring and control over the risks involved in. Negative conclusions: contrary to the empirical findings of positive impact of e-banking on the performance of the banks, many researchers found negative impact. Using a panel data of fifteen Jordanian banks for the period of 2000–2010, Al-Smadi and Al(2012)

It is undoubted that electronic based banking provides relatively low risk, high return and low cost advantages. It can be said that there are many studies addressing the impact of the performance based on the profitability of banks which offer electronic banking products. These are some of the studies dealing with the electronic and internet banking applications that effect bank's performance. For example Sullivan (2000), DeYoung (2001), Hasan (2002), Pigni et al. (2002), Kagan (2005), Arnaboldi and Claeys (2008), Ciciretti et al. (2009), Weigeltve Sarkar (2012). These studies showed that electronic banking applications required advanced technology increasing the overall profitability of the banks' in the US and European countries. It is essentially obtained that internet banking has a significant positive contribution to development of competition in the banking sector and banks' performance. Therefore, internet banking applications make bank to build the orientation of technological innovations up(Arnaboldi and Claeys, 2008, Ciciretti et al. 2009). It has been observed that technology-based and in particular internet banking products reduce the operational risk of the banks (Hasan 2002, Ciciretti et al., 2009). Internet banking applications increase the asset quality of banks and therefore increase the operational profitability and ROE performance directly (Kagan 2005).

Al-Samadi and Al-Wabal (2011), Khrawish and Al-Sa'di (2011), Sumra et al. (2011),Hosein (2013), Malhotra and Singh (2006, 2007, 2009), Gutu (2014) studies upon developing countries such as India, Pakistan, Jordan and Romania. Many of these studies show that electronic banking applications diminishing operational costs and increasing profitability performance of banks. It is necessary relatively short time to cope with and exceed initial setup cost of internet banking and other electronic-based activities. This situation is encouraging electronic banking activities in developing countries. However, customer portfolio must be expanded in order to increase the bank performance (Sumra et al., 2011).

2.10. Benefits of Electronic Banking

Banks just like other businesses are tuning to information technology to improve business efficiency, service quality and attract new customers (Nath et al, 2001). Al-Sukkar and Hasan (2005) aver that the most important factors encouraging consumers to use online banking are lower fees followed by reducing paper work and human error. Subsequently electronic channels can lead to lower transaction costs which are very competitive (Claessens and Kliengbiel, 2000). Kiang et al (2000) is of the view that disputes can be minimized between the employees as there

is a clear flow of processes. Conducting business outside the normal branch working hours has also been a factor that has been considered convenient for bankers. According to Jayawardhena and Foley (2000) each ATM has the capacity to carry out the same, essentially routine, transactions as do human tellers in branch offices but at half the cost and with a four to one advantage in productivity. Thus banks can provide customers convenient, inexpensive access to the bank 24 hours a day and seven days a week.

Increased availability and accessibility of more self-service distribution channels help bank administration in reducing the expensive branch network and associated staff overheads (Birch and Young, 1997). A reduction in the percentage of customers visiting the banks with an increase in alternative channels of distribution will also minimize the queues in branches (Thornton and White, 2001). According to Thornton and White (2001) this ultimately leads to improved customer satisfaction. Jayawardhena and Foley (2000) observe that electronic banking increases competition within the banking system and also from non-bank financial institutions. Electronic banking also increases the power of the customer to make price comparisons across suppliers quickly and easily and as a consequence this pushes prices and margins downward (Devlin, 1995).

Kerem (2003) observes that banks are responding to electronic banking differently and that those which see electronic banking as a complement and substitute to the traditional channels achieved better communication and interactivity with the customers. Online banking extends the relationship with the customers through providing financial services right into the home or office of customers (Robinson, 2000). Al-Sukkar and Hassan (2005) support the view that technology can improve service quality for banks and enhance customer satisfaction and loyalty.

According to Nath et al (2001) provision of high quality services may also lead to high profit consumers for the bank. Polatoglu and Ekin (2001) argue that early adopters and heavy users of internet banking services are more satisfied with the services compared to the other customer groups. According to Joseph and Stone (2003) the ability to deliver services via technology is positively correlated with satisfaction. Smith (2006) emphasizes the importance of human and technology based delivery channels in improving the level of bank customer satisfaction, retention, and switching. E-banking customers do not face problems of handling a lot of money,

submission of utility bills and waiting in a long queue for services. In Bangladesh, there is huge demand for e-banking from the business community as well as the urban retail customers.

Rahman (2009) observes that 99 percent of the branches of private commercial banks (PCBs) in Bangladesh were computerized by December 2006. The average for all bank branches was 37 percent since only 4 percent and 16 percent of specialized banks (SBs) and state-owned commercial banks (SCBs) respectively were computerized. One of the most important developments in Zimbabwe's banking sector has been the steady but sometimes disturbed development of electronic banking (Dube et al, 2009). The adoption of electronic banking in Zimbabwe has been underpinned by the growth of internet connectivity in the country. Internet has changed the dimensions of competition in the retail banking sector. In Zimbabwe the adoption of electronic banking services was first visible in the early 1990s where Standard Chartered Bank and CABS set up the first ATMs. Over the past years other electronic banking products have come into sight such as the Electronic Funds Payment systems, telephone-banking, PC banking and even internet banking (Njanike, 2010). It has been observed that growth in internet connectivity Zimbabwe has greatly improved financial inclusion of previously marginalized and excluded communities in the Zimbabwean economy. Technological innovations and competition in the banking sector have improved accessibility to a wide range of services to retail and wholesale customers.

Electronic banking has been viewed a valuable and powerful tool driving development, supporting growth, promoting innovation and enhancing competitiveness (Kamel, 2005 and Nath et al, 2001). The evolution of banking technology has been evidenced by transitions from ATMs, phone banking, PC banking to internet banking (Chang, 2003). Other studies show that electronic banking has been adopted by banks to achieve a competitive advantage, reduce costs and maintain a strategic position (Bradley and Stewart, 2003). Zimbabwe also has been part of the worldwide trend into the use of advanced technology, and this has been recognized through growth in the usage of electronic delivery channels such as ATMs and the internet.

Other benefits that have accrued because of the adoption of electronic banking in developed countries include the ability to attract new customers and widening the customer database, improving bank marketing and communication, and having the ability to retain high profit

customers (Al-Sukkar and Hasan, 2005). Lack of user-friendly technology, customer demand, high initial set-up costs, redundancy of existing high-cost legacy systems, economic instability, regulatory controls and lack of suitable skills have been highlighted as some of the most important issues delaying the adoption or diffusion of electronic banking (Bradley and Stewart, 2003, Kerem, 2003 and Chang, 2003). In Zimbabwe the adverse sector specific factors hampering the adoption or diffusion of electronic banking were exacerbated by the economic downturn which started in 1997 and culminated in the economic meltdown of 2008 (Njanike, 2008, Kairiza, 2009).

2.11. Bank Performance Indicators

Good Financial performance is the ultimate goal of commercial banks. All the strategies designed and activities performed thereof are meant to realize this grand objective. However, this does not mean that commercial banks have no other goals. Commercial banks could also have additional social and economic goals. However, the intention of this study is related to the first objective, financial performance. Studies made on the financial performance of commercial Banks largely used Return on Asset(ROA) and Return on Equity(ROE) as a common measure (Murthy &Sree, 2003; Alexandru, 2008; Ezra, 2013).

As concluded by extensive Prior academic research there are different accounting based measures for banks' profitability. For instance, Return on Equity (ROE) used by (Goddard, J., Molyneux, P. and Wilson, S. J., 2004), Return on Assets (ROA) used by (Flamini, McDonald, & Schumacher, 2009), the Return on Equity (ROE) and Return on Assets (ROA) utilized by (Athanasoglou, Delis, &Staikouras , 2006) and (Ommeren, 2011), ROE, ROA and Profit Earning Ratio (PER) applied by (Moin, 2008)and among others, (Huizinga &Demirguc - Kunt, 1999)uses the net interest margin (NIM) as proxy for banks' Financial performance.

2.11.1. Return on Equity (ROE)

ROE is a financial ratio that refers to how much profit a company earned compared to the total amount of shareholder equity invested or found on the balance sheet. ROE is what the shareholders look in return for their investment. A business that has a high return on equity is more likely to be one that is capable of generating cash internally. Thus, the higher the ROE the better the company is in terms of profit generation. It is further explained by (Khrawish, 2011)that ROE is the ratio of Net Income after Taxes divided by Total Equity Capital. It represents the rate of return earned on the

funds invested in the bank by its stockholders. ROE reflects how effectively a bank management is using shareholders' funds. Thus, it can be deduced from the above statement that the better the ROE the more effective the management in utilizing the shareholders capital.

2.11.2. Return on Asset (ROA)

ROA is also another major ratio that indicates the profitability of a bank. It is a ratio of Income to its total asset (Khrawish, 2011). It measures the ability of the bank management to generate income by utilizing company assets at their disposal. In other words, it shows how efficiently the resources of the company are used to generate the income. It further indicates the efficiency of the management of a company in generating net income from all the resources of the institution (Khrawish, 2011). (Wen, 2010), state that a higher ROA shows that the company is more efficient in using its resources.

2.12. Control Variables

2.12.1 Liquidity Management

Liquidity is another factor that determines the level of bank performance. Liquidity refers to the ability of the bank to fulfill its obligations, mainly of depositors. According to (Dang & Uyen, 2011) adequate level of liquidity is positively related with bank profitability. The most common financial ratios that reflect the liquidity position of a bank according to the above author are customer deposit to total asset and total loan to customer deposits.

Other scholars use different financial ratio to measure liquidity. For instance (Ilhomovich, 2009) used cash to deposit ratio to measure the liquidity level of banks in Malaysia. However, the study conducted in China and Malaysia found that liquidity level of banks has no relationship with the performances of banks (Said & Mohd, 2011). In the Ethiopian context there seems clear measure of the liquidity: the liquid asset to deposit ratio, which the National Bank of Ethiopia, has set the minimum liquid asset of the Bank not to be less than 15% of the Bank's net current liability. Out of this the directive obliged banks to hold 5% of them in primary reserve assets (NBE Directives No.SBB/9/95).

2.12.2. Bank Size

Bank size which is measured by total deposits (Dietrich & Wanzanried, 2009) and Al-Alami (1991) or assets (Smirlock, 1985) is one of the control variable that determines the financial performance of the commercial banks. Studies conducted on determinants of bank profitability took bank size variable, as considered to an important determinants of bank performance (Kosmidou K, 2008). If the relative size of a firm expands its market power and profits increases, this is the Market-Power (MP) hypothesis. The hypothesis also referred to as the Structure Conduct-Performance (SCP) hypothesis (Athanasoglou, Sophocles, & Matthaios, 2005).

2.13. Conceptual Framework

Based on the above literatures, the researcher adapted from Sullivan (2000), DeYoung (2001) and Hasan (2002) the conceptual framework to study the effect of e-banking and bank performance of selected commercial Banks in Ethiopia.

Independent Variables

Dependent Variables

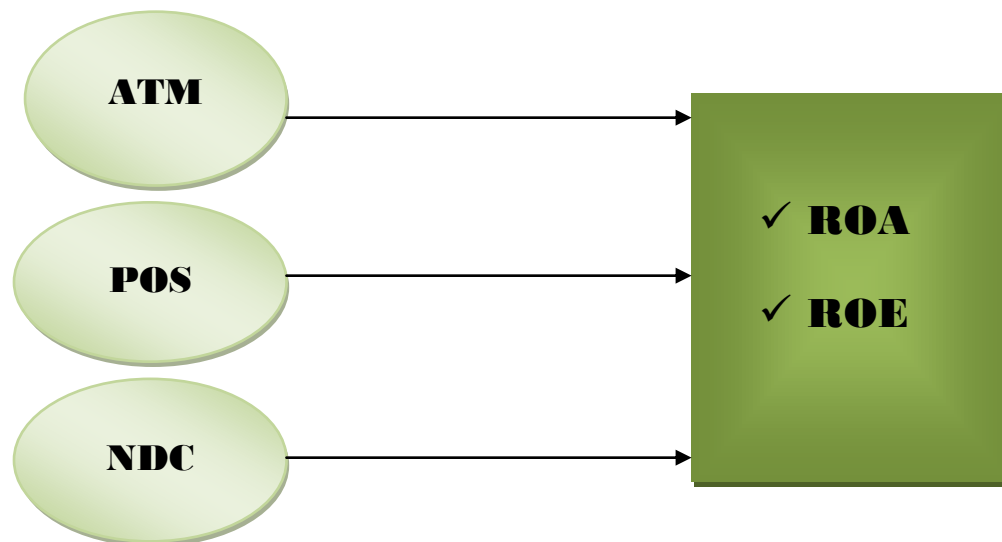


Figure 2.3.: Conceptual Framework

Adapted from: Sullivan (2000), DeYoung (2001) and Hasan (2002)

Chapter Three: Research Approach and Methodology

3.1 Introduction

This chapter outlines the rationale of research approach and methodology used in this study. It includes research approach, research design, data type, research method, sampling design, unit of analysis, variables of the study, data analysis and research model.

3.2 Research Approach

Quantitative and qualitative research programs claim different philosophical perspectives, and correspondingly, work with different underlying assumptions. Quantitative research identifies with positivism, which, presented by Gall, Borg, and Gall (1996), is the belief “that physical and social reality is independent of those who observe it”. Quantitative researchers are concerned with an objective reality that is “out there to be discovered” (Krathwohl, 1998) and the researcher is independent of that which is being researched (Creswell, 1994). Looking at the quantitative approach, Shulman (1986) speaks of the positivistic or etic (own point of view) perspective of the researcher as, (“an outside observer attempting to discover a law of relationships among observable features”).

According to Creswell (2009) Quantitative research is a means for testing objective theories by examining the relationship among variables. These variables in turn, can be measured, typically on instruments so that numbered data can be analyzed using statistical procedures. Experimental designs are research approach for obtaining information about causal relationship and also allowing research to assess the correlation between one variable and another (Kothari 2004)

Furthermore, Creswell (2003), there are three type of research design .These are quantitative, qualitative and mixed methods approach .Decisions about choice of a design are influenced by the research problem or issue being studied, the personal experiences of the researcher, and the audience for whom the researcher writes.

Considering the research problem and objective along with the philosophy of the different research approaches, the quantitative nature of the data collected, quantitative research approach is found to be appropriate for this study.

3.3 Research Method

This research used quantitative panel data. According to Stephanie (2008) in experimental design, researchers plan to measure the response variable depending on the explanatory variable. The response variable is an outcome measure for predicting or forecasting purposes of a study. It is also called dependent variable or predicted variable. Any variable that explains the response variable is called explanatory variable. It is also called independent variable or predictor variable. The most important factor in the experimental design is randomization.(John, A. Hafiz, T.A. Khan, R. and Raeside, D. (2007) “experimental (quantitative) designs are said to be the approach for obtaining information about causal relationships, allowing researchers to assess the correlation (relationship) between one variable and another” A principal factor of such designs is that one element is manipulated by the researcher to see whether it has any impact upon another (Robson 1993).

The purpose of this secondary data and document survey study is to test the Economic Rationale of E-Banking, task technology fit and innovation diffusion theory with respect to the independentvariables (i.e. ATM, POS and Debit card) to dependent variables such as; ROE and ROA onfinancial performance of commercial banks. The subsequent discussions in this sectiondescribe the method used in investigating the effect of e-banking commercial banks performance.

3.4 Research design

According to Kothari (2008), research design is the conceptual structure within which research is conducted, it constitutes the blueprint for the collection, measurement and analysis of data as such the design includes an outline of what the researcher did from writing the hypothesis and its operational implications to the final analysis of data.Bhattacharjee (2012) defined a research design, a comprehensive plan for data collection in an empirical research project. It has also indicated the two categories of data collection techniques used in scientific research, quantitative and qualitative design.

According to Creswell (2003), the objective to be achieved in the study is a base for determining the research approach for the study. In case, if the problem identified is factors affecting the outcome having numeric values, it is quantitative research.

Therefore, the researcher employed quantitative research approach to see the regression result analysis with respective empirical literatures on the effect of e-banking on commercial banks performance. This quantitative study gathered information from the Financial Statements of the bank. The years that were considered were 2011 to 2015, solicit information concerning the E-banking and bank performance. A panel data is analyzed using E-Views, econometric software version 9.

3.5. Sample & Population

There are eighteen banks in Ethiopia, out of which, seventeen are commercial banks and the other is Development bank. Among the total eighteen banks, two of them are owned by the government and the remaining sixteen are privately owned (Birritu 2015) Hence, The main objective of the study is to examine the effects of E-banking services on commercial Banks performance in Ethiopia, the seventeen commercial banks can be treated as population of the study. In line with balanced panel data approach, to meet the desired objective of this study and to make generalization from sample to population, the researcher used maximum combination of years and number of banks and achieved the maximum number of observations through purposive sampling technique. Thus, out of seventeen commercial banks that are registered and operated in Ethiopia, six are selected. Sampled commercial Banks which are early adopter of E-banking services, Commercial Bank of Ethiopia, Awash International Bank, Dashen Bank, Wegagen Bank, Nib International Bank and Zemen Bank. So the researcher believed that the sample size is sufficient to make sound conclusion about the population. The banks are selected based on the purposive sampling methodology taking maximum combination of years and number of banks and achieved the maximum number of observations. Therefore, the matrix for the frame is 5*6 that includes 30 observations.

These Commercial Banks are selected purposively, because the use of purposive sampling enables the researcher to generate meaningful insights that help to gain a deeper understanding of

the research phenomena by selecting the most informative participants that is satisfactory to its specific needs.

3.6 Data Type and Source

The sources of data for this research were secondary sources. In order to carry out any research activity information should be gathered from proper sources. Bank specific data were collected from financial statements (i.e. Balance Sheet and Profit & Loss Statement) of each selected commercial banks included in the sample and NBE. The data were collected from 2011 to 2015 on annual base and the figures for the variables were on June 30th of each year under study. Consistent and reliable research indicates that research conducted by using appropriate data collection instruments increase the credibility and value of research findings (Koul, L 2006).

3.7. Method of Data Analysis

To achieve the objectives the study, five years (2011 to 2015) panel data of six commercial banks is used. The collected panel data are analyzed using the descriptive statistics and multiple regressions. The analysis of the descriptive statistics, the mean, and standard deviation, maximum and minimum values are used to analyze the trends of the data. The study used EViews version 9 software. Furthermore, a diagnostic test has been used in order to check the validity of the model based on the assumption of the Classical Linear Regression Model (CLRM).

3.8. Controlled Variables

In order to isolate the effects of E-banking on bank performance, it is needed to control for other factors that are expected to have some influence on profitability. The control variables which are expected to influence bank's profitability included in this study are bank size and liquidity. Although there are other variable that affect bank performance the study focus on the below variables only:

Bank Size: The size of the bank is also included as an independent variable. As noted in Kapur and gualu (2011) inclusion of this independent variable helps to account for size related economies (scale economies with reduced costs, or scope economies that result in loan and

product diversification, thus providing access to markets that a small bank cannot entry) and diseconomies of scale. The banks that enjoy economies of scale incur a lower cost of gathering and processing information resulting in high financial flexibility and ultimately high spreads (Afzal, 2011). This means bigger banks can have lower costs per unit of income and therefore higher net interest margin. Similarly, banks with larger branch network can penetrate deposit markets and mobilize savings at a lower cost. Size is used to capture the fact that larger banks are better placed than smaller banks in harnessing economies of scale in transactions to the plain effect that they will tend to enjoy a higher level of profits. Size of the bank is being measured using yearend natural log of total assets. Most empirical studies reviewed find size to be positively related to profitability. Consequently, a positive relationship is expected between size and profits.

Liquid Assets: Liquidity is another factor that determines the level of bank performance. Liquidity refers to the ability of the bank to fulfill its obligations, mainly of depositors. According to (Dang &Uyen, 2011) adequate level of liquidity is positively related with bank profitability. The most common financial ratios that reflect the liquidity position of a bank according to the above author are customer deposit to total asset and total loan to customer deposits

Liquid Asset is which can be easily converted to cash, are often associated with the lower rate of return. Hence, high liquidity would affect profitability negatively (Guru et al., 2000). We use the ratio of total loans to total deposits to measure liquidity (LIQ). A negative sign is expected to this variable.

3.9. Empirical Model

Performance refers to the degree of success in attaining stated objective (Sathye, 2005). The major objective of banks as other financial institutions is maximizing shareholders' wealth. Following the literature, Return on Equity (ROE) and Return on Asset (ROA) is the common measure of performance.

Data analysis was done using E-view Version 9 whereby multiple regression models was employed. To test the effects of electronic banking on profitability of commercial banks in Ethiopia, a logit regression model was used:

$$Y_{jt} = C + \alpha X_{jt} + \beta Z_t + \varepsilon_{jt} \text{ ----- (1)}$$

j refers to the commercial bank; t refers to year; Y_{jt} is the dependent variable and refers to the return on equity (ROE) of bank j in a particular year t; C is the intercept; X represents the independent variable which is Electronic Banking, whereas Z represents the other determinants of commercial bank profitability; α and β are co-efficient and ε_{jt} represent the error term. The significance of the regression model will be determined at 95% confidence interval and 5% level of significance. The empirical model to be used in the study to test the effect of electronic banking on profitability of commercial banks in Ethiopia is presented as follows:

$$ROE_{jt} = C + \beta_1 POS_{jt} + \beta_2 ATM_{jt} + \beta_3 DC_{jt} + \beta_4 LOGTA_t + \beta_5 LIQ + \varepsilon_{jt} \text{ ----- (2)}$$

Where:

ROE_{jt}: return on Equity for bank j in year t

POS_{jt}: is the point of sale which was measured by number of POS terminal.

ATM_{jt}: is the Automatic Teller Machine which was measured by number of ATM.

DC_{jt}: is the Debit cards which was measured by number of Debit cards users.

LOGTA_{jt}: is the bank size which was measured using the natural log of total Asset for bank j in year t.

LIQ_{jt}: is the bank liquidity which was measured by using parentage of total loans to total deposits.

$$ROA_{jt} = C + \beta_1 POS_{jt} + \beta_2 ATM_{jt} + \beta_3 DC_{jt} + \beta_4 LOGTA_t + \beta_5 LIQ + \varepsilon_{jt} \text{ ----- (3)}$$

Where:

ROA_{jt}: return on Asset for bank j in year t

POS_{jt}: is the point of sale which was measured by number of POS terminal.

ATM_{jt}: is the Automatic Teller Machine which was measured by number of ATM.

DC_{jt}: is the Debit cards which was measured by number of Debit cards users.

LOGTA_{jt}: is the bank size which was measured using the natural log of total Asset for bank *j* in year *t*.

LIQ_{jt}: is the bank liquidity which was measured by using parentage of total loans to total deposits.

3.10 Model Assumptions

The following diagnostic tests were carried out to ensure that the data suits the basic assumptions of classical linear regression model.

Normality: To check the normality, descriptive statistics was used. A normal distribution is not skewed and is defined to have a coefficient of kurtosis of (Brooks, 2008). One of the most commonly applied tests for normality; the Bera-Jarque formalizes these ideas by testing whether the coefficient of Skewness and the coefficient of excess kurtosis are zero and three respectively. (Brooks, 2008) Also states that, if the residuals are normally distributed, the histogram should be bell-shaped and the Bera-Jarque statistic would not be significant at 5% significant level.

Normality is defined as the "shape of the data distribution or an individual metric variable and its correspondence to the normal distribution, which is the benchmark for statistical methods" (Hair *et al.*). Violation of normality might affect the estimation processor the interpretation of results especially in Ordinary Least squared analysis.

Multicollinearity: There were different arguments towards the multicollinearity problem. multicollinearity problems exist when the correlation coefficient among variables greater than 0.75 (Gujarati D. N., 2004).According to Cooper &Schendlar (2003) Suggested that a correlation above 0.8 between explanatory variables can cause multicollinearity problem. Lastly, (Hair JF, 2006) argued that also correlation coefficient below 0.9 may not cause serious multicollinearity problem. In contrary to this, (Kennedy, 2008) argued that as any correlation coefficient above 0.7 could cause a serious multi collinearity problem leading to inefficient estimation and less reliable results. A correlation matrix used to ensure the correlation.

Heteroscedasticity According to Brooks(2008), Heteroscedasticity means that error terms do not have a constant variance. If heteroscedasticity occur, the estimators of the ordinary least

square method are inefficient and hypothesis testing is no longer reliable or valid as it will underestimate the variances and standard errors. There are several tests to detect the Heteroscedasticity problem, which are Park Test, Glesjer Test, Breusch-Pagan-Goldfrey Test, White's Test and Autoregressive Conditional Heteroscedasticity (ARCH) test. In this case, this study chooses to use ARCH test to detect Heteroscedasticity.

H0: There is no Heteroscedasticity problem in the model.

H1: There is Heteroscedasticity problem in the model.

Decision Rule: Reject H0 if p-value greater than significance level. Otherwise, do not reject H0.

Tests for Autocorrelation: Assumption that is made of the CLRM's disturbance terms is that the covariance between the error terms over time (or cross-sectional, for that type of data) is zero. In other words, it is assumed that the errors are uncorrelated with one another. If the errors are not uncorrelated with one another, it would be stated that they are "auto correlated" or that they are "serially correlated". A test of this assumption is therefore required. To test the presence of autocorrelation, to test for autocorrelation the researcher apply Breusch-Godfrey Serial Correlation LM test.

Table 3.1 Summary of variables used and their specification

Variable Measurement	Legend	Expected sign
Return on equity Net profit(before taxes)/equity	ROE	+
Return on Asset Net profit(before taxes)/total asset	ROA	+
Number of POS	NPOS	+
Number of ATM	NATM	+
Number of NDC	NDC	+
Size logarithm of total assets	SIZE	+
Liquidity Total loans/total deposit	LIQ	—

Chapter Four: Results and Discussions

4.1 Introduction

This chapter presents the data findings to determine the effect of electronic banking on performance of commercial banks in Ethiopia. These data were collected from the National Bank of Ethiopia and selected commercial banks in Ethiopia. Regression analysis was done for the periods to determine the effects of electronic banking on performance of commercial banks in Ethiopia. The study covered a period of 5 Years from the year 2011 to 2015.

4.2. Descriptive Statistics

Descriptive statistics is the term given to the analysis of data that helps describe, show or summarize data in a meaningful way. Descriptive statistics are very important because if we simply presented the data it would be hard to visualize what the data was showing, especially if there was a lot of it. Descriptive statistics therefore enables us to present the data in a more meaningful way, which allows simpler interpretation of the data.

The research statistics of each variables of the study have been discussed here under. The variables included the dependent and independent variables. The dependent variable used in this study in order to measure the sample commercial banks performance is ROA and ROE whereas the explanatory variables are number of ATM; POS and Debit cards. Accordingly, the summary statistics for all variables are presented below in table 4.1. The descriptive table included mean, maximum, minimum, standard deviation and observations of both of dependent and independent variables of the study. Basically, a small standard deviation means that the values in a statistical data set are close to the mean of the data set, on average, and a large standard deviation means that the values in the data set are farther away from the mean, on average. The standard deviation measures how concentrated the data are around the mean; the more concentrated, the smaller the standard deviation. The general rule stated that the higher value of standard deviation implies greater spread of data, smaller the standard deviation shows the data is concentrated around the mean.

Table 4.1 Summary Statistics – Dependent and Independent Variable

Variable	ROA	ROE	NDC	NPOS	NATM	LIQUIDITY	SIZE
Mean	0.038600	0.468500	178656.4	324.5333	139.0667	56.24956	10.23290
Median	0.036500	0.311500	52492.50	200.0000	81.50000	55.95508	10.09965
Maximum	0.063000	0.791000	1604363.	1886.000	644.0000	71.00000	12.38095
Minimum	0.020000	0.146000	0.000000	0.000000	0.000000	42.43139	9.207748
Std.Dev	0.010871	0.275250	329846.0	408.1609	146.2374	6.834916	0.656485
Skewness	0.527276	1.532552	3.271603	2.091094	1.741294	0.151706	1.411576
Kurtosis	2.566761	4.072190	13.69136	8.113860	6.057226	2.673531	5.352133
Jarque-Bera	1.624718	13.18057	196.3985	54.55283	26.84380	0.248302	16.87840
Probability	0.443810	0.001374	0.000000	0.000000	0.000001	0.883247	0.000216
Sum	1.158000	12.61070	5359693.	9736.000	4172.000	1687.487	306.9870
Sum Sq. Dev.	0.003427	2.197122	3.16E+12	4831265.	620175.9	1354.766	12.49820
Observations	30	30	30	30	30	30	30

Source; own computations

As depicted on the above table 4.1, the mean, maximum, minimum and standard deviation values of variables, a dataset of 30 observations provides the basis for descriptive analysis. This study has used seven variables for the analysis and interpretation, including two dependent variables, ROA and ROE. The mean value of bank ROA was around 3.86 percent for sampled commercial banks in Ethiopia. Furthermore, the bank ROA growth fluctuates between 2 and 6.3 percent. This means, commercial banks were achieved 3.86 percent average return on asset from the period of 2011-2015. From this, we can apparently see that, with the introduction of electronic banking in last few years, ROA of banks have been improved.

In addition, the average value of bank ROE was around 46.85 percent for sampled commercial banks in Ethiopia. Furthermore, the bank ROE growth fluctuates between 14.6 to 79.1 percent which is high ROE in the industry. This means, commercial banks were achieved 46.85 percent average return on equity from the period of 2011-2015. From this, we can apparently see that, with the introduction of electronic banking in last few years, ROE of banks have been improved.

Regarding one of the independent variable, number of debit cards the mean, maximum and minimum observations were 178,656, 1,604,363 and 0 respectively. In addition, the standard

deviation were 329,846 shows large standard deviation means that the values in the data set are farther away from the mean, on average, means the effort of some banks on distribution of debit cards high.

About, number of POS terminal the mean, maximum and minimum observations were 325, 1,886 and 0 respectively. In additions that the values in the data set are farther away from the mean called standard deviation were 408.

Concerning, number of ATM installed by Banks the mean, maximum and minimum observations were 139, 644 and 0 respectively .In additions that the values in the data set are farther away from the mean called standard deviation were 146.

In case of liquidity of the banks, the minimum value is 42.43139, the maximum value is 71, and the standard deviation is 6.834916. This could be attributed to the fact that Ethiopia banks have experienced liquidity problems in last few years. Although, Greater liquidity may be required for virtual banks than for traditional banks; should liquidity risk be perceived considerably higher than for traditional banks (IMF Policy Discussion Paper, 2002).

4.3 Testing the Classical Linear Regression Model (CLRM) Assumptions

To make the regression analysis, the researcher computed the year on year percentage changes of Dependent variables to simplify the numbers and regressed against three independent variables (Debit Cards, ATM and POS) and two control variables (liquidity and Bank size.) The regression analysis is used to test if an independent variable influences a dependent variable and whether this effect is positive or negative. For that to be applied and workable, diagnostic testing has to be done. The econometric estimation technique that is used by this study is ordinary least square (OLS). There are five assumptions made in relation to the classical linear regression model (CLRM). The researcher has tested if their presence of the violation of these assumptions. The method used to test these assumptions by the researcher is described as follows:

4.3.1. The Assumption of Average Value of the Error is Zero

The first assumption required is that the average value of the errors is zero. In fact, if a constant term is included in the regression equation, this assumption will never be violated. In this case the model have constant term which is proved that the line did not pass through the origin and

the first assumption of CLRM is not violated. Therefore the variation in the dependent variables both ROA and ROE is explained by the independent variables.

4.3.2. Heteroskedasticity

The OLS method assumes no heteroskedasticity, hence this issue is not taken into account in the OLS method. This means that in the OLS method, the variances in the unobservable error are constant across all observations (Wooldridge, 2000). Since the data used in this study are panel data, heteroskedasticity could become an issue. The presence of heteroskedasticity, while not causing bias or inconsistency in the coefficients, does invalidate the usual standard errors, t statistics and F statistics. Hence it could bias the statistical significance concluded from the OLS analysis (Wooldridge, 2000). To test for heteroskedasticity, the Breusch-Pagan / Cook-Weisberg test and the White's general test are conducted. The White's general test is a general test which does not presume a particular form of heteroskedasticity. Panel data is likely to the presence of out layers. In order to detect heteroskedasticity in the data test was conducted by using Breusch-Pagan-Cook Weisberg test for heteroskedasticity.

Table 4.2 Heteroskedasticity Test:ROE

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.521743	Prob. F(5,24)	0.2204
Obs*R-squared	7.221473	Prob. Chi-Square(5)	0.2047
Scaled explained SS	4.583274	Prob. Chi-Square(5)	0.4688

Source; own computations

Table 4.3Heteroskedasticity Test:ROA

F-statistic	0.986092	Prob. F(5,24)	0.4467
Obs*R-squared	5.112736	Prob. Chi-Square(5)	0.4023
Scaled explained SS	3.130613	Prob. Chi-Square(5)	0.6799

Source; own computations

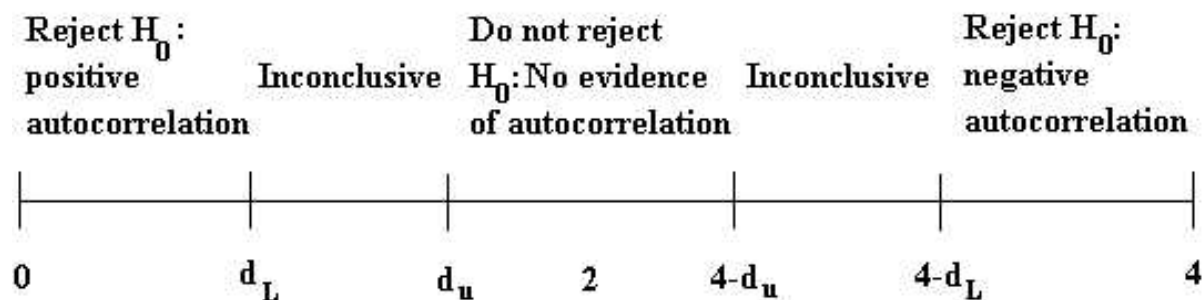
The figures in the above two tables showed that the variable value greater than 5 percent; the data have significant correlation with the given study variable. Therefore, the data are linear and normally distributed. Since the results of the study data have passed the normality test of the model; hence, the data concerned are used in the result analysis and discussion described in the following chapter of the paper.

4.3.3. The Assumption of Autocorrelation

Covariance between the error terms overtime (or cross sectional, for the type of data) is zero; it is assumed that the errors are uncorrelated with one another. In other words, it is assumed that the errors are uncorrelated with one another. If the errors are not uncorrelated with one another, it would be stated that they are 'auto correlated' or that they are 'serially correlated'. The study uses Durbin-Watson test (DW test) to test autocorrelation. The null hypothesis for this test is the error at the current time and the error at previous time is independent of one another (there is no autocorrelation) and the alternative hypothesis is that the error at the current time is dependent on the error of the previous time (there is evidence for the presence of autocorrelation). Therefore if the null hypothesis is rejected then it is said that there is an evidence for the presence of autocorrelation.

According to Brooks (2008), the DW test does not follow a standard statistical distribution such as a t , F , or χ^2 . DW has 2 critical values: an upper critical value (d_U) and a lower critical value (d_L), and there is also an intermediate region where the null hypothesis of no autocorrelation can neither be rejected nor not rejected. The rejection, non-rejection, and inconclusive regions are shown on the number line in figure 4.1 below.

Figure 4.1 Rejection and non-rejection regions for DW test



The null hypothesis is rejected and the existence of positive autocorrelation presumed if DW is less than the lower critical value (dL); the null hypothesis is rejected and the existence of negative autocorrelation presumed if DW is greater than 4 minus the lower critical value (4-dL); the null hypothesis is not rejected and no significant residual autocorrelation is presumed if DW is between the upper critical value (dU) and 4 minus the upper critical limits (4-dU) (Brooks 2008).

The study has five explanatory variables (k) and 5 years period of time. So it has total of thirty observations and as per the DW table in Appendix-III for 30 observations with five explanatory variables at level of Significance $\alpha = .05$, the dL and dU values are 1.07 and 1.83, respectively. Accordingly, the value of 4-dL and 4-dU are 2.93 and 2.17, respectively. The DW value of this study is 1.910907, (Appendix-III) which lies in the no evidence of autocorrelation region where the null hypothesis of no autocorrelation do not be rejected. Therefore, given these result it can be concluded that there is no evidence for the existence of autocorrelation.

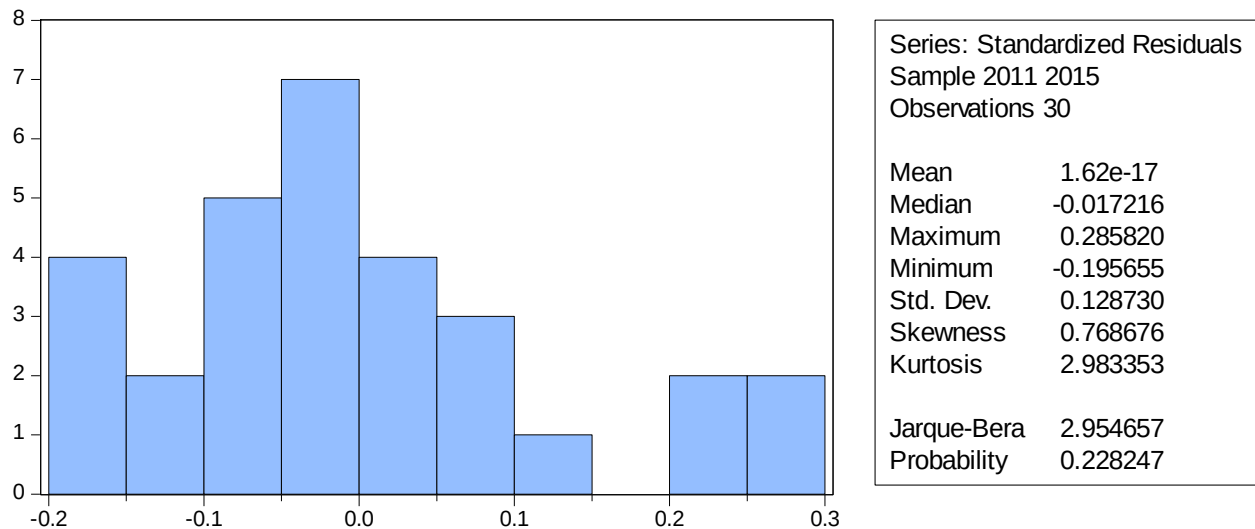
4.3.4. The Assumption of Disturbances are normally Distributed

The fifteenth important diagnostic test conducted in this paper is the normality assumption. According to Brooks (2008), one of the most commonly applied test for normality is the Bera-Jarque (BJ) test. According to Brooks (2008), if the residuals are normally distributed, the histogram should be bell-shaped and the BeraJarque statistic would not be significant.

This means that the p-value given at the bottom of the normality test screen should be greater than 0.05 to support the null hypothesis of presence of normal distribution at the 5 percent level. Theoretically, if the test is not significant, then the data are normal, so any value above 0.05 indicates normality. On the other hand, if the test is less than 0.05 which proves significance and then the data are non-normal. Bera-Jarque formalizes this by testing the residuals for normality and testing whether the coefficient of skeweness and kurtosis are close to zero and three respectively. Skewness measures the extent to which a distribution is not symmetric about its mean value and kurtosis measures how fat the tails of the distribution are. The null hypothesis is

that the distribution is normal and the alternate hypothesis is that the distribution is not normally distributed. Therefore if the null hypothesis is rejected then the distribution is not normally distributed.

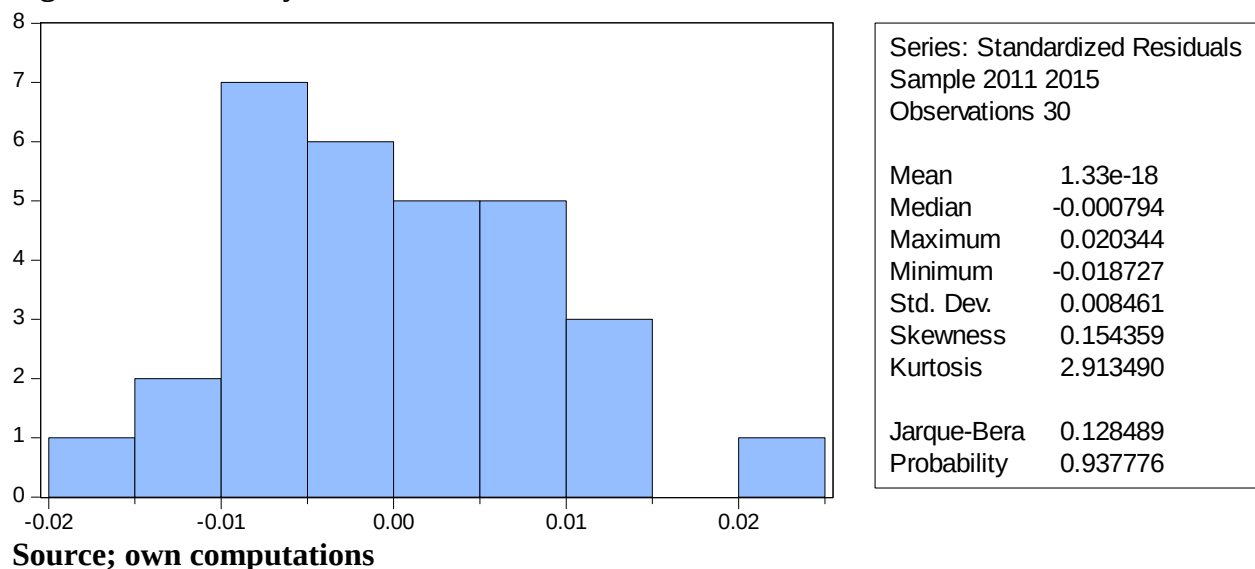
Figure 4.2 Normality Test for Residuals for ROE



Source; own computations

In this study, Bera-Jarque normality tests have been used for normality test. As shown in the above histogram, kurtosis approaches to three which is 2.98. On the other hand the p-value for the BJ test is 2.95 which is not significant to reject the null hypothesis. Thus the result of the test implies that the data were consistent with a normal distribution assumption.

Figure 4.3 Normality Test for Residuals for ROA



In this study, a Bera-Jarque normality test has been used for normality test. As shown in the above histogram, kurtosis approaches to three which is 2.91. On the other hand the p-value for the BJ test is 0.13 which is not significant to reject the null hypothesis. Thus the result of the test implies that the data were consistent with a normal distribution assumption.

4.4.4. Correlation Matrix and Multicollinearity

First, there is a correlation matrix created in which all variables are included. This matrix shows the correlations and their corresponding significance between the variables. The correlation matrix gives a first insight in the direction and the strength of the relationships between the variables. When the correlation between two or more independent variables is (too) high, the problem of multicollinearity occurs (Wooldridge, 2000). The problem of multicollinearity may lead to less accurate results in the analyses; the coefficients may have very high standard errors and perhaps even incorrect signs or implausibly large magnitudes. Multicollinearity can be detected by calculating the variance inflation factors (VIF) for each independent variable. Multicollinearity is present when VIF values are larger than 10. Furthermore, the critical value can be calculated by $1/\text{VIF}$. If this value is below 0.1, this would mean that more than 90% of the variation in the variable is explained by the other variables. The variable(s) with VIF values larger than 10 or $1/\text{VIF}$ values below 0.1 should be excluded from the analyses Brooks (2008).

Multicollianrity problems exist when the correlation coefficient among variables greater than 0.75. Brooks, 2008 suggested that a correlation above 0.8 between explanatory variables should be corrected for. Lastly, (Wooldridge, 2000) argued that also correlation coefficient below 0.9 may not cause serious multicolinary problem. A correlation matrix was used in this study to ensure the correlation between explanatory variables. Then balanced panel data models are applied to control for multicollinearity.

4.5. Fixed Effect versus Random Effect Model

The generally accepted way of choosing between fixed and random effects is running a Hausman test. Statistically, fixed effects are always a reasonable thing to do with panel data (they always give consistent results) but they may not be the most efficient model to run. Random effects will give you better P-values as they are a more efficient estimator, so you should run random effects if it is statistically justifiable to do so.

The Hausman test does not indicate a significant deference ($p > 0.05$), however, it does not necessarily follow that the random effects estimator is safely" free from bias, and therefore to be preferred over the fixed estimator.

The random effects model is more appropriate when the entities in the sample can be thought of as having been randomly selected from the population while fixed effect model is more appropriate when the entities in the sample effectively constitutes the entire population (Brooks, 2008).

Accordingly in this study, the number of cross section units is six and the number of time series data were five, as the sample of commercial banks were not selected randomly, the fixed effect model is more appropriate than the random effect model and then the fixed effect model is used in this study.

4.6. Results of Regression Analysis

Regression analysis is a technique used in statistics for investigating and modeling the relationship between variables (Douglas Montgomery, Peck, & Vinning, 2012). If there is more than one regressor, it is called multiple linear regressions.

Regression results of fixed effect model effect of e banking and Bank performance the case study on commercial banks of Ethiopia. This regression analysis is based on the data collected from National Bank of Ethiopia and commercial Banks in Ethiopia. The relationship between twodependent variable and five independent variables is regressed using econometric software called EViews 9. Thus, the model used to examine statistically significant effect of E-banking and Bank performance;

$$A) ROE_{jt} = C + \beta_1 POS_{jt} + \beta_2 ATM_{jt} + \beta_3 DC_{jt} + \beta_4 LOGTA_{jt} + \beta_5 LIQ_{jt}$$

$$B) ROA_{jt} = C + \beta_1 POS_{jt} + \beta_2 ATM_{jt} + \beta_3 DC_{jt} + \beta_4 LOGTA_{jt} + \beta_5 LIQ_{jt}$$

Table 4.5 Effect of E-banking on Return on Equity

Dependent Variable: ROE
Method: Panel Least Squares
Date: 05/22/17 Time: 17:43
Sample: 2011 2015
Periods included: 5
Cross-sections included: 6
Total panel (balanced) observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPOS	0.011352	0.000121	2.916356	0.0485
NDC	0.000001	0.037492	2.051043	0.0098
NATM	0.031981	0.000515	1.904995	0.0013
LIQUIDITY	-0.037434	0.003496	1.352616	0.0003
SIZE	0.293300	0.073697	3.979802	0.0000
C	2.027027	0.858730	2.360495	0.0285
Effects Specification				
Period fixed (dummy variables)				
R-squared	0.715831	Mean dependent var		0.420357
Adjusted R-squared	0.618455	S.D. dependent var		0.275250
S.E. of regression	0.146050	Akaike info criterion		-0.748532
Sum squared resid	0.426613	Schwarz criterion		-0.281466
Log likelihood	21.22798	Hannan-Quinn criter.		-0.599114
F-statistic	9.222562	Durbin-Watson stat		1.014442
Prob(F-statistic)	0.000021			

(Source: Authors' computation)

As mentioned earlier, the purpose of regression analysis in this study was to examine the importance of each independent variable in explaining the variation of commercial banks performance in terms of ROA and ROE. Accordingly, the estimation result of panel regression model used in this study is presented in table 4.5.

As shown from the above tables, the R-squared statistics and the adjusted-R squared statistics of the model were 71.58 % and 61.84 % respectively. The adjusted- R² of this study indicates that, 61.84 % of the variation on the dependent variable ROE was explained by the changes in the independent variables. Thus it can be concluded that, all the independent variables used in this study collectively, were good explanatory variables of commercial banks performance.

As it shown on table 4.5, describes the names of the explanatory variables, their (Beta) estimate (β), the standard errors of the estimates (S.E.), and the (C.R.) t statistic of each coefficient, which is simply the ratio of estimate divided by its standard error, and the p value, or the exact level of significance of the C.R. statistic. For each estimate, the null hypothesis is that the population value of that estimate is zero, that is, the particular regressor has no influence on the regress and, after holding the other regressor values constant. Moreover, the smaller the p value, the greater the evidence against the null hypothesis.

Hypothesis Testing

Hypothesis H1_ATM is a positive relationship with return on equity of commercial banks in Ethiopia. As can be observed from table above NATM (number of automated teller machine) and ROE (Return on equity) have a positive $\beta=0.031981$ and t-value 1.904995 with a P value 0.0013 statically significant even 1% level of significant. Thus the null hypothesis ATM is not a positive relationship with return on equity of commercial banks in Ethiopia is rejected.

The findings of the study concur with the finding of Al-Samadi and Al-Wabal (2011), Khrawish and Al-Sa'di (2011), Sumra et al. (2011), Hosein (2013), Malhotra and Singh (2009), Gutu (2014) studies upon developing countries such as India, Pakistan, Jordan and Romania. These studies show that electronic banking applications specifically, ATM diminishing operational costs and increasing profitability performance of banks. However, customer portfolio must be expanded in order to increase the bank performance (Sumra et al., 2011).this also supported Ethiopia commercial banks highly focus on attracting new customer and retaining the existing customer especially in recent time.

Furthermore, According to Jayawardhena and Foley (2000) each ATM has the capacity to carry out the same, essentially routine, transactions as do human tellers in branch offices but at half the cost and with a four to one advantage in productivity. Thus banks can provide customers convenient, inexpensive access to the bank 24 hours a day and seven days a week.

Hypotheses H2 – POS has a positive relationship with return on Equity of commercial banks in Ethiopia. As can be observed from table above POS (point of sales) and ROE (return on equity) have a positive $\beta=0.011352$ and t-value 2.916356 with a P value of 0.0485 thus the null hypothesis POS has not a positive relationship with return on Equity of commercial banks in Ethiopia is rejected.

The findings of the study agree with the funding of Abaenew et al. (2013), Hassan et al. (2013), Oyewole et al. (2013) made studies on Kenya and the result showed that POS has positively Effect on bank performance measured by ROE.

Hypotheses H3 – A Bank debt cards has a positive relationship with return on Equity of commercial banks in Ethiopia. As can be observed from table above NDC (number of debit cards) and ROE (return on equity) have close to zero $\beta=0.000001$ and t-value 2.051043 with a P value of 0.0098 thus the null hypothesis is fail to rejected. The findings of the study agree with the results of Al-Samadi and Al-Wabal (2011), Khrawish and Al-Sa'di (2011), and the result showed that NDC has no significant effect on ROA.

Table 4.6, Effect of E-banking on Return on Asset

Dependent Variable: ROA

Method: Panel EGLS (Cross-section fixed effects)

Date: 05/22/17 Time: 17:50

Sample: 2011 2015

Periods included: 5

Cross-sections included: 6

Total panel (balanced) observations: 30

Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPOS	0.011162	0.050189	2.514561	0.0122
NDC	-0.000003	0.023454	2.701750	0.0125
NATM	0.016352	0.050189	2.761324	0.0109
LIQUIDITY	-0.010352	0.000295	-0.118673	0.0005
SIZE	0.063802	0.054386	0.866856	0.0046
C	0.055702	0.050189	0.113600	0.0105
Effects Specification				
			S.D.	Rho
Cross-section random			5.25E-09	0.0000
Idiosyncratic random			0.009129	1.0000
Weighted Statistics				
R-squared	0.600387	Mean dependent var		0.038600
Adjusted R-squared	0.575921	S.D. dependent var		0.010871
S.E. of regression	0.009300	Sum squared resid		0.002076
F-statistic	8.124121	Durbin-Watson stat		1.685124
Prob(F-statistic)	0.000098			
Unweighted Statistics				
R-squared	0.577795	Mean dependent var		0.038600
Sum squared resid	0.006138	Durbin-Watson stat		1.685124

Source; own computations

Accordingly, the estimation result of panel regression model used in this study is presented in table 4.6 related to ROA. The R-squared statistics and the adjusted-R squared statistics of the model were 60 % and 57.5 % respectively. The adjusted- R² of this study indicates that, 57.5 % of the variation on the dependent variable ROA was explained by the changes in the independent variables. Thus it can be concluded that, all the independent variables used in this study collectively, were good explanatory variables of commercial banks performance.

As it shown on above table 4.6, describes the names of the explanatory variables, their (Beta) estimate (β), the standard errors of the estimates (S.E.), and the (C.R.) t statistic of each coefficient, which is simply the ratio of estimate divided by its standard error, and the p value, or the exact level of significance of the C.R. statistic. For each estimate, the null hypothesis is that the population value of that estimate is zero, that is, the particular regressor has no influence on the regress and, after holding the other regressor values constant. Moreover, the smaller the p value, the greater the evidence against the null hypothesis.

Hypothesis Testing

Hypotheses H4 –ATM has a positive relationship with return on Asset of commercial banks in Ethiopia As can be observed from table above NATM (number of ATM) and ROA (return on assets) have a positive $\beta=0.016352$ and t-value 2.761324 with a P value of 0.0109 therefore the null hypothesis is rejected.

The findings of the study agree with the funding of Hernando and Nieto (2007), Onay et al. (2008) made studies on Spain and Turkey respectively, and the result showed that ATM has positively Effect on bank performance measured by ROA. These studies show that electronic banking applications specifically, ATM diminishing operational costs and increasing profitability performance of banks.

Hypotheses H5 – POS has a positive relationship with return on Asset of commercial banks in Ethiopia As can be observed from table above POS (Point of sales terminals) and ROA (return on assets) have a positive $\beta=0.011162$ and t-value 2.514561 with a P value of 0.0122 thus the null hypothesis is rejected.

The findings of the study agree with the funding of Abaenew et al. (2013), Hassan et al. (2013), Oyewole et al. (2013) made studies on Kenya and the result showed that POS has positively Effect on bank performance measured by ROA.

Hypotheses H6 –NDC has a positive relationship with return on Asset of commercial banks in Ethiopia As can be observed from table above NDC (number of debit cards) and ROA (return on assets) have close to zero $\beta=-0.000003$ and t-value 2.701750 with a P value of 0.0125 thus the null hypothesis is fail to rejected.

4.7. Summary of Hypothesis Testing on ROE

Variables	Coefficient	P-value	Observation	Decision
POS	0.011352	0.0485	p-value>0.05	Reject null
ATM	0.031981	0.0013	p-value>0.05	Reject null
NDC	0.000001	0.0098	p-value>0.05	Fail to reject
SIZE	0.293300	0.0000	p-value>0.05	Reject null
LIQUIDITY	-0.037434	0.0003	p-value>0.05	Reject null

Source; own computations

4.8. Summary of Hypothesis Testing on ROA

Variables	Coefficient	P-value	Observation	Decision
POS	0.011162	0.0122	p-value>0.05	Reject null
ATM	0.016352	0.0109	p-value>0.05	Reject null
NDC	-0.000003	0.0125	p-value>0.05	Fail to reject
SIZE	0.063802	0.0046	p-value>0.05	Reject null
LIQUIDITY	-0.010352	0.0005	p-value>0.05	Reject null

Source; own computations

Chapter Five: Conclusion and Recommendation

The basic intent of this chapter is to present the overall overviews of the research by summing up the main findings of the analysis part and give future research directions. Accordingly, the chapter starts with its discussion by briefly sum up the overviews of the study and its main findings. In section two based on the study finding the researcher highlight some recommendations for the target populations the study pivoting on.

5.1. Conclusion

The study empirically analyzed the effect of E-Banking in commercial banks performance in Ethiopia by constructing an econometric model to study the effect of various factors such as debit cards, automated teller machine and point of sale and two control variables (liquidity and size).

Accordingly, the effects of E-Banking on return on asset and return on equity in commercial banks in Ethiopia were carefully analyzed using the OLS technique. The findings indicate that almost all the banking services under consideration affect the profitability. However, the number of NDC has no effect on both ROA and ROE.

Based on the findings of the study, it can be concluded that E-banking influence financial performance of commercial banks in Ethiopia positively. The adoption of E-banking by commercial banks has a high potential of improving financial performance and hence better returns to the shareholders. The versatility of E-banking has made their adoption rate to be high among both the banks and their customers. It could have been challenging if the adoption was only with either the banks or the customers. Banks in Ethiopia have continued to perform well even when other sectors of the economy show lagged performance.

5.2. Recommendations

The study recommends to the management of banks which are slow in innovation adoption, to move in and adopt various innovations in their operations in order to shore up their profitability. This recommendation is well supported by the fact that in Ethiopia, the leading banks in terms of profitability are mostly the fast movers in adoption of new technologies.

The study also recommends to the management of banks, can save on money by not paying for tellers or for managing branches. Plus, it's cheaper to make transactions over e banking and improve financial performance. Profitability is crucial to shareholders and the market is also keen on the profitability of organizations. Any ethical and responsible attempts to improve profitability of a company will be appreciated by the shareholders. Commercial banks should therefore continue to adopt new technologies which will improve their margins and hence their profitability in order to maximize shareholder wealth.

Since the findings of this research concluded that e-banking affect bank performance positively, The National Bank of Ethiopia should prepare various capacity building activities for banks regarding e-banking operation and provide incentives for banks to invest rigorously on ICT and use of e-banking by banks and customers.

Government policy makers should also review policies related to promotion of innovation adoption and transfer of technology. Government should encourage adoption of innovations that will improve profitability of organizations because it will convert to better tax revenues for the government.

5.3 Further Research

This research is an important contribution to the literature due to the findings of the study which will help policy makers to formulate policy. This research examined the effects of e banking service, such as, Debit card, ATM and POS on performance of commercial banks in Ethiopia.

However, there are other variables (e-banking services and control variables) that were not included in this study. Therefore, future researchers may be interested in validating the consistency of the result and provide supplementary results for this study by including other macro-economic variables example GDP and Inflation.

Despite that, there is a feeling that views banks should discharge their social responsibility by employing human tellers instead of installing more automatic teller machines and other e banking services that reduce employees and government employee's tax. Because of this fact the profitability of the banks vis-à-vis with their social responsibility should be studied to find optimal solution for banks and society in general.

References

- Abaenewe, Z. C., Ogbulu, O. Maxwell, & Ndugbu, M. O. (2013). Electronic banking and bank performance in Nigeria. *West African Journal of Industrial and Academic Research*, 6(1), 171-187.
- Acharya, R.N. and Kagan, A. 2004, "Commercial B2B Web site attributes within the ." *Journal of Internet Commerce* 3(4): 79-91.
- Acquah, P.A (2006). Evaluating the Banking System in Ghana. Fifth Banking Awards Ceremony, Accra, 6 May 2006.
- Adesina and Ayo. 2010, "E- banking implimentation in Nigeria." *Journal of Internet Banking and Commerce*,: 2013-30.
- Aduda, J., & Kingoo, N. (2012). The relationship between electronic banking and financial performance among commercial banks in Kenya. *Journal of Finance and Investment Analysis*, 1(3), 99-118.
- Agboola, A. 2006, "Information and communication technology (ICT) in banking operations in Nigeria: An evaluation of recent experiences." August 2015 18th, Ajzen. 1991, "The theory of planned behavior". *Organizational Behavior and Human Decision Processes*. 50: pp 179-211.
- Akram & Allam. 2010, "The impact of information technology on improving banking performance matrix: Jordanian banks as case study." *European, Mediterranean & Middle Eastern Conference on Information Systems 2010*, April 2010 12-13,.
- Alam, S. S., Khatibi, A., Santhapparaj, A. S., and Talha, M. (2007). Development and prospects of internet banking Bangladesh. *Competitive Review: An International Business Journal*, 17(1/2), 56-66.
- Al-Samadi, M. O., & Al-Wabal, S. A. (2011). The impact of e-banking on the performance of Jordanian banks. *Journal of Internet Banking & Commerce*, 16(2), 1-10.
- American Journal of Computer Technology & Application, 1(10), 138-148. Hosein, S. S. M. (2013). Consideration the effect of e-banking on bank profitability; Case study selected Asian countries. *Journal of Economics & Sustainable Development*, 4(11), 112-117.
- Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, 68(1), 29-51.

- Arnaboldi, F., & Claeys, P. (2008). Internet banking in Europe: a comparative analysis. Research Institute of Applied Economics Working Papers, No. 2008/11.
- Assefa, Tafa Million. 2013, "The Impact of Electronic banking on customer's satisfaction in Ethiopian banking industry: (The case of customers of Dashen and Wogagen banks in Gondar city)." (<http://ssrn.com/abstract=2354281>).
- Bagozzi. 1992, "The self-regulation of attitude, intention and behavior." Article in Social Psychology Quarterly, may: 178-204.
- Barki and Hartwick. 1994, "The role of user participation in information system." Management Science, 40: 59-82.
- Barnes, S.J. 2003, "Enterprise mobility: Concepts and examples." International Journal of Mobile Communications 1(4): 341-359.
- Basle Committee on Banking Supervision (1998) Risk management for electronic banking and electronic money activities, Basle.
- Batiz-Lazo, B., & Woldeesenbet, K. 2006, "The dynamics of product and process innovation in UK banking." International Journal of Financial Services Management 1 (4),
- Bhattacharjee, A. (2012). Social Science Research: Principles, Methods and Practices (2nd ed.). Global Text Project.
- Corbetta, P. (2003). Social science research: Theory, Methods and Techniques. SAGE Publications Ltd.
- Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. Journal of Econometrics, 87(1), 115-143.
- Brush, T. H., Dangol, R., & O'Brien J. P. (2012). Customer capabilities, switching costs, and bank performance. Strategic Management Journal, 33, 1499-1515.
- Carlson, J., Furst, K., Lang, W. W., & Nolle, D. E. 2001, "Internet Banking: Market Developments and Regulatory Issues." Paper presented at the Society of Government Economists Conference 2000. Washington, DC,
- Ciciretti, R., Hasan, I., & Zazzara, C. (2009). Do Internet activities add value? Evidence from the traditional banks. Journal of Financial Services Research, 35(1), 81-98.
- Creswell J. (2003); Qualitative, Quantitative and Mixed Methods Approaches, 2nd ed.
- Creswell, J. W. (2009). Research design: Qualitative, Quantitative and Mixed Method Approaches. Los Angeles: Sage Publications Ltd.

- Davis, F.D., Bagozzi, R.P., Warshaw, P.R.(1989),“User acceptance of computer technology: a comparison of two theoretical models” ,*Management Science*, Vol. 35,No. 8, pp. 982-1003.
- DeYoung, R. (2001). The financial performance of pure play Internet banks. Federal Reserve Bank of Chicago, *Economic Perspectives*, Issue Q1, 60-75.
- Dubois, M., Bobillier-Chaumon, M. E., & Retour, D. (2011). The impact of development of customer online banking skills on customer adviser skills. *New Technology, Work & Employment*, 26(2), 156-173.
- Gakure, R., & Ngumi, P. (2013). Do bank innovations influence profitability of commercial banks in Kenya? *Prime Journal of Social Science*,2(3), 237-248.
- Goddard, J., Liu, H., Molyneux, P., & Wilson, J. O. S. (2011). The persistence of bank profit. *Journal of Banking & Finance*, 35, 2881-2890.
- Gutu, L. M. (2014). The impact of internet technology on the Romanian banks performance. 12th International Academic Conference, Prague, 1September 2014.
- Hansen, L. P. (1982). Large sample properties of generalized method of moment’s estimators. *Econometrica*, 50(4), 1029–1054.
- Hasan, I. (2002). Do Internet activities add value? The Italian bank experience. *Fondo Interbancario Di Tutela Dei Depositi, Essays*, No. 2, July.
- Hassan, S. U., Maman, A., & Farouk, Musa A. (2013). Electronic banking products and performance of nigerian listed deposit money banks.
- IMF Policy Discussion Paper, International Monetary Fund, Washington, D. C. (2002)
- ITU (2006) “Cyber security guide for developing countries, ITU, Geneva, 2006.
- Kagan, A., Acharya, R. N., Rao, L.S., & Kodepaka, V. (2005). Does Internet banking affect the performance of community banks? *American Agricultural Economics Association Annual Meeting*, July 24-27, 2005, Providence, Rhode Island.
- Kalakota, R., Whinston, A.B., 1997. *Electronic Commerce: A Manager’s Guide*. Addison Wesley, Reading, MA.
- Khrawish, H. A., & Al-Sa’di, N. M. (2011). The impact of e-banking on bank profitability: Evidence from Jordan. *Middle Eastern Finance & Economics*, Issue 13, 142-158.
- Malhotra, P., & Singh, B. (2006). The impact of Internet banking on bank’s performance: The Indian experience. *South Asian Journal of Management*, 13(4), 25-54.

- Malhotra, P., & Singh, B. (2007). Determinants of Internet banking adoption by banks in India. *Internet Research*, 17(3), 323-339.
- Malhotra, P., & Singh, B. (2009). The impact of Internet banking on bank performance and risk: The Indian experience. *Eurasian Journal of Business & Economics*, 2(4), 43-62.
- Okiro, K., & Ndungu, J. (2013). The impact of mobile and internet banking on performance of financial institutions in Kenya. *European Scientific Journal*, 9(13), 146-161.
- Olson & Zanna, 1993, "Attitudes are an efficient way to size up the world." *Journal of Psychology*,.
- Oyewole, O. S., El-Maude, A. M., Gambo, J., & Abam, A. I. (2013). E-banking and bank performance: Evidence from Nigeria. *International Journal of Scientific Engineering & Technology*, 2(8), 766-771.
- Pigni, F., Ravarini, A., Tagliavini, M., & Vitari, C. (2002). Bank strategies and the Internet: An interpretation of the banking industry on the Italian retail market. *Journal of Information Technology Case & Application Research*, 4(3), 837.
- Roodman, D. (2006). How to do xtabond2: An introduction to "difference" and "system" GMM in Stata. Center for Global Development Working Paper, No: 103, December.
- Roodman, D. (2008). A note on the theme of too many instruments. Center for Global Development Working Paper, No: 125, May.
- Sullivan, R. J. (2000). How has the adoption of Internet banking affected performance and risk in banks? Federal Reserve Bank of Kansas City, Financial Industry Perspectives, 1-16.
- Sumra, S. H., Manzoor, M. K., Sumra, H. H., & Abbas, M. (2011). The impact of e-banking on the profitability of banks: A study of Pakistan banks. *Journal of Public Administration & Governance*, 1(1), 31-38.
- Weigelt, C., & Sarkar, M.B. (2012). Performance implications of outsourcing for technological innovations: Managing the efficiency and adaptability trade-off. *Strategic Management Journal*, 33, 189-216.
- Wilson. 1999, "Models in information behaviour research." *Journal of Documentation*,
- Wondwossen, T and Tsegai, G. 005, E-payment: challenges and opportunities in Ethiopia. Addis Ababa Ethiopia: Economic commission for Africa, 2.
- Yang and Yoo. 2004, "The role of attitude in the acceptance of information." *Journal of educational technology & society* 80(4): 841-8.

- Zigurs, I., & Buckland, B.K. 1998, "A theory of task-technology fit and group support system effectiveness." *MIS Quarterly* 22(3): 313-334.
- Zigurs, I., Buckland, B.K., Connolly, J.R., & Wilson, E.V. 1999, "A test of task technology fit theory form group support systems. *Database for Advances in Information Systems.*" *MIS Quarterly* 30(3): 34-50.

Appendixes

Correlation Matrix

Variables	NPOS	NDC	NATM	LIQUIDITY	SIZE
NPOS	1.000000				
NDC	0.750954	1.000000			
NATM	0.640414	0.748827	1.000000		
LIQUIDITY	-0.026470	-0.320671	-0.167494	1.000000	
SIZE	0.514413	0.774273	0.730706	-0.388428	1.000000

Dependent Variable: ROA

Method: Panel EGLS (Cross-section fixed effects)

Date: 05/22/17 Time: 17:50

Sample: 2011 2015

Periods included: 5

Cross-sections included: 6

Total panel (balanced) observations: 30

Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
NPOS	0.011162	0.050189	2.514561	0.0122
NDC	-0.000003	0.023454	2.701750	0.0125
NATM	0.016352	0.050189	2.761324	0.0109
LIQUIDITY	-0.010352	0.000295	-0.118673	0.0005
SIZE	0.063802	0.054386	0.866856	0.0046
C	0.055702	0.050189	0.113600	0.0105

Effects Specification

	S.D.	Rho
Cross-section random	5.25E-09	0.0000
Idiosyncratic random	0.009129	1.0000

Weighted Statistics

R-squared	0.600387	Mean dependent var	0.038600
Adjusted R-squared	0.575921	S.D. dependent var	0.010871
S.E. of regression	0.009300	Sum squared resid	0.002076
F-statistic	8.124121	Durbin-Watson stat	1.685124
Prob(F-statistic)	0.000098		

Unweighted Statistics

R-squared	0.577795	Mean dependent var	0.038600
Sum squared resid	0.006138	Durbin-Watson stat	1.685124

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.521743	Prob. F(5,24)	0.2204
Obs*R-squared	7.221473	Prob. Chi-Square(5)	0.2047
Scaled explained SS	4.583274	Prob. Chi-Square(5)	0.4688

F-statistic	0.986092	Prob. F(5,24)	0.4467
Obs*R-squared	5.112736	Prob. Chi-Square(5)	0.4023
Scaled explained SS	3.130613	Prob. Chi-Square(5)	0.6799