The effect of financial innovation on financial performance of commercial banks in Ethiopia

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Declaration

I, Rukiya Temam, hereby declare that the thesis work entitled "***The effect of financial innovation on financial performance of commercial banks in Ethiopia"*** submitted by me for the award of the degree of Master of Accounting and Finance of Addis Ababa University at Addis Ababa Ethiopia, is original work and it hasn't been presented for the award of any other Degree, Diploma, Fellowship or other similar titles of any other university or institution.

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Certification

Addis Ababa University

School of graduate studies

This is to certify that the thesis prepared by Rukiya Temam entitles: ***The effect of financial innovation on financial performance of commercial banks in Ethiopia*** and submitted in partial fulfillment of the requirements for the degree of masters of Science in accounting and finance compiles with the regulations of the university and meets the accepted standards with respect to originality and quality.

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Abstract

The purpose of this study was to examine the effect of financial innovations on the financial performance of Commercial Banks in Ethiopia. An explanatory study was carried out on commercial banks, to assess the impact of financial innovation on the profitability. The study has examined the effect of financial innovation on return on assets as one of the most fundamental indexes of profitability. The study used secondary data employed purposive sampling technique to select nine banks for the study commercial banks operating in Ethiopia covering the periods from 2015 to 2017. Key explanatory variables were identified to disclose their relationship and influence on financial performance of commercial banks. These independent and a control variables are number of mobile banking users, number of automated teller machine terminals, number of new saving accounts, number of point of sale terminal, debit cardholders and managerial efficiency. Data was analyzed using both descriptive and inferential statistics. Multiple regression with the aid of E-view 9 software was used to examine the effect of independent variables on return on asset (ROA). Result using fixed effect panel least square regression exhibited that numbers of mobile banking users and number of new saving accounts have positive and significant effect on financial performance of commercial banks measured by return on asset. The study shows that increased number of mobile banking users and number of new saving accounts had a positive effect on the financial performance of commercial banks by reducing transaction cost and mobilizing deposit. However, numbers of ATM terminals have a negative and significant effect on financial performance of commercial banks due to high initial investment as compared to income generated. Number of point of sale terminals and number of debit cardholders are insignificant to profitability of Ethiopia. These are due to inaccessibility and lack of awareness on bank users. In addition, management efficiency shows a negative relation were management are not cost effective in commercial banks of Ethiopia. Generally, financial innovation has positive effect on financial performance of commercial banks in Ethiopia. Therefore, this study recommends for enhancing return on asset, commercial banks should exert more on awareness creation about financial innovation service and keep up on introducing and implementing financial innovations across the country.

Key Words: *Financial innovation; Commercial banks; ROA; Mobile banking, new saving account, ATM, POS, Debit card and E-views 9.*

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List of Acronyms

ATM- Automated Teller Machine

BLUE- Best Linear Unbiased Estimator

CBE- Commercial Bank of Ethiopia

CLRM- Classical Linear Regression Model

E-banking- Electronic banking

EFT- Electronic Fund Transfer

IMF- International Money Fund

NBE- National Bank of Ethiopia

NIM-Net Interest Margin

DC- Debit Card

OLS- Ordinary Least Square

PIN- Personal Identification Number

PBT- Profit before Tax

POS- Points of Sale

ROA- Return on Asset

ROI- Return on Investment

RTGS- Real Time Gross Settlement

SMFI- Somalia Microfinance Institution

SMS- Short Message Service

SWIFT- Society for Worldwide Interbank Financial Telecommunication

TTF- Task-Technology fit Theory

WBT- Web Based Transaction

Contents

Part one: Introduction

1.1 Background of the study

The financial system in all economy is composed of the Bank -based system where provision and monitoring of investments funds are made through the banks on one hand and the stock market where investors (surplus units) enter directly through ownership of securities. Banks play an intermediary role of mobilizing funds from savers and subsequently lend them to investors-individual/corporations.

Banks play a key role in improving economic efficiency by channeling funds from resource surplus unit to those with better productive investment opportunities. Banks also play key role in trade and payment system by significantly reducing transaction costs and increasing convenience (NCA, 2006). In less monetized countries, like Ethiopia, whereas financial sector is dominated by banking industry, effective and efficient functioning of the latter has significant role in accelerating economic growth.

The sector that has been most radically affected by the information technology developments is the banking system. The information technology has become a critical business resource because its absence could result in poor decisions and ultimately business failure. Technology has opened up new markets, new products, new services and efficient delivery channels for the banking industry. (Dangolani, 2011)

The Growth of high-speed networks and computing power is making possible to process different banking services or applications in microseconds undreamed of in the past. These Rapid explosions of technology are changing the banking industries from paper and branch banks to digitized and networked banking services (Wakeham, 2010).

Financial innovation is a broad term that is used to describe the generation of new and creative approaches to different financial circumstances. Schumpeter (1939) defines innovation as change in the shape of the production function. He categorizes innovations as being either “process” that permits an existing product or service to be provided more cheaply, or “product or service” that is new to the market. Financial innovation is the unanticipated improvement in the array of financial products and instruments that are stimulated by unexpected change in customer needs and preferences, tax policy, technology and regulatory impulses (Bhattacharyya & Nanda, 2000).

The role of innovations in the economic development is indisputable. The general definition of innovations explains that they appear when new ideas, solutions and instruments are implemented in order to change the conditions of the business entity and to improve its situation. The application of innovations increases the competitiveness of a business entity and creates value for its owners (compare: Dabic, Cvijanovic and Gonzalez-Loureiro, 2011, p. 196; Grudzewski, Hejduk, Sankowska and Wańtuchowicz, 2010, p.116). They are crucial in the economic development process. They can reduce the intermediaries' and the clients' transaction costs and as a result brings about widening, deepening and integration of financial markets. This process thereby accelerates economic growth by stimulating savings, investment and production.

Financial innovations are used by banks as formidable strategic variables to outstrip the competition and have become an essential means for the bank to improve its performance and to maintain its effectiveness on the market (Batiz-Lazo and Woldesenbet, 2006).A successful innovation thus generates a proprietary competitive position that bestows on the firm a competitive advantage and superior performance (Lyons, Chatman & Joyce, 2007)

According to Allan and Gale (1994), the benefits of financial innovation include avoiding regulations and optimizing taxes, reducing transaction costs and increasing liquidity of market-based products, reducing agency costs between executive management and shareholders and between shareholders and creditors, reducing informational asymmetry between corporate insiders and outsiders, increasing risk sharing opportunities and making capital intermediation more efficient and cheaper for clients.

Ethiopian banking system is very much behind in the adoption of financial innovations compared to the rest world. However, the Ethiopian financial sector cannot remain an exception in expanding the use of the system (Gardachew, 2010). According to Rahel (2015) the benefits of technological innovations like E-banking are well known by the banks and represent a formidable force to drive implementation of E-banking system.

In recent years the banking sector has shown massive growth and development. The much of the growth in the banking sector has been witnessed in branch expansion and growth in capital base.(NBE,2015) Ethiopian banks have been engaged in many innovation where ATM, Debit card, POS, Agency Banking, internet banking and mobile banking have taken root in various banks. Delivering banking services on this networked environment are more convenient and effective than ever before. Expanding the geographical coverage of digitized and networked banking services are the mainstreams for banks to deliver Quality Service to customers (NBE, 2012)

1.2 Statement of the problem

Banking is a rapidly changing industry, and the biggest paradigm shift that has occurred is the move to digital-only banks. Traditional banks have had to innovate in order to stay ahead of the pack (Meola, 2016). Electronic Banking has been widely used in developed countries and is rapidly expanding in developing countries. In fact, Ethiopia was started to use electronic payment system. The banking industry in Ethiopia has undergone phenomenal growth over the last decade. The notable innovations in banking and financial sector include the emergence of ATM, Internet banking, mobile banking, Agency banking, free advisory services and others. Ethiopian commercial banks deploy huge investment in bank innovation and there is an increment in innovational products and system. For example, data indicated that number of ATM machine in 2011 was 58 and 70 for CBE and Dashen Bank respectively. But the number increased to 6,985 and 220 respectively for both banks in 2017 (CBE Staff report (2012), CBE website and Annual report of Dashen Bank).

Financial innovations arise due to several reasons (Batiz-Lazo and Woldesenbet, 2006). Gorton and Metrick (2010) and Batiz-Lazo and Woldesenbet (2006) summarize the reasons for the growth of modern financial innovation as; reduction in bankruptcy costs, tax advantages, reduction in moral hazard, reduced regulatory costs, transparency and customization. There are many driving forces that initiate Ethiopian commercial banks for adoption and development of E-banking technology. According to Kassahun (2016), The driving forces are desire to improve performance, desire to improve the relationship with customers, rapidly changing customers' needs and preferences, desire to improve organizational performance, desire to cover wide geographical area, desire to build organizational reputation and desire to reduce transaction cost. In addition, increasing competition among banks to increase or retain their customer base is driving the banks to adopt and develop E-banking technologies. Adoption of e-banking services has the benefit of attracting high value customers, enhanced image, larger customer coverage, improvement of organizational efficiency, and load reduction etc. from the viewpoint of the banks (Mattewos, 2016).

Despite the significance of financial innovation in demystifying performance in banks, the effect of innovation on financial performance, is still misunderstood for two main reasons, first, there is inadequate understanding about the drivers of innovation and secondly innovations impact on banks financial performance remains lowly untested (Mabrouk and Mamoghli, 2010). Innovations generally seem to have a positive effect in raising financial performance of the innovators. But in Ethiopian commercial banks since innovations take place every now and then, it is interesting to

understand its effect on financial performance of commercial banks in Ethiopia at the present time. Therefore, there is need to establish whether innovations have contributed to the financial performance of commercial banks in Ethiopia.

The outcome of the previous studies on effect of financial innovation on performance has been empirically inconclusive (Bonn, 2000). Previous studies have produced mixed results regarding the effect of financial innovations on banks financial performance. Scholars (Pooja and Singh, 2009: Franscesa and Claeys, 2010), in their studies concluded that financial innovations had least impact on financial performance, while others (Batiz-Lazo and Woldesenbet, 2006: Mwania and Muganda, 2011) concluded that financial innovation had significant contribution to financial performance. Lerner (2006) puts forward that innovations are not just critical for firms in the financial services industry, but also affect other companies; for instance, enabling them to raise capital in larger amounts and at a lower cost than they could otherwise and that innovation is an important phenomenon in any sector of a modern economy. It is at the center of such mixed conclusions that created and necessitated the need to carry out a study the effect of financial innovations on commercial banks performance.

In Ethiopia, various studies have been conducted on adoption of E-banking (Abenet, 2010) and (Ayana, 2012), Challenges and Opportunities in adapting E-banking (Gardachew 2010), (Abreham, 2012), (Kassahun, 2016), (Mattewos, 2016), (Abebe, 2016) and (Tekabe and Gadise, 2016), Barreir and benefit of E-Banking system in Ethiopia Rahel (2015), customer satisfaction to measure the efficiency of E-banking (Sintayehu, 2015) are conducted. In addition, there are few researches conducted on effect of E-banking on financial performance (Tilahun, 2016) and (Solomon, 2016). Tilahun (2016) and Solomon (2016) are conducted to examine the effect of E-banking on financial performance of commercial banks in Ethiopia. These studies concentrate only on E-banking or technological innovations which are ATM, POS and Debit Card. However, this study widens the scope of E-banking to financial innovation which includes both technological and technical (Managerial) innovations. Therefore, innovation in new saving account is included in the study as one variable to represent financial innovation. In addition, on the previous studies only product innovations (ATM, POS and Debit card) was used while institutional innovation is included (Mobile banking) as one independent variable to represent financial innovation in this study. A gap in the literature motivated this study as the study sought to answer the research question, what is the effect of financial innovations on financial performance of commercial banks in Ethiopia?

1.3 Objective of the research

1.3.1 General Objective

The objective of the study is to examine the effect of financial innovations on financial performance of commercial banks in Ethiopia focusing on its effect on return on total assets (ROA).

1.3.2 Specific Objective

The specific aim of this study was:-

- To examine the effect of mobile banking on financial performance of commercial banks in Ethiopia.
- To examine the effect of ATM on financial performance of commercial banks in Ethiopia.
- To examine the effect new saving Account on financial performance of commercial banks in Ethiopia.
- To examine the effect POS of on financial performance of commercial banks in Ethiopia.
- To examine the effect of debit card on financial performance of commercial banks in Ethiopia.

1.4 Hypothesis

The study was done based on the following research hypothesizes which were derived from empirical evidences and tested throughout the analysis of the study:

Hypothesis 1: Mobile Banking has positive and significant effect on profitability of commercial banks in Ethiopia.

Hypothesis 2: ATM has positive and significant effect on profitability of commercial banks in Ethiopia.

Hypothesis 3: New Saving Account has positive and significant effect on profitability of commercial banks in Ethiopia.

Hypothesis 4: POS has significant has positive and significant effect on profitability of commercial banks in Ethiopia.

Hypothesis 5: Debit card has significant has positive and significant effect on profitability of commercial banks in Ethiopia.

Hypothesis 6: Managerial Efficiency has negative and significant effect on profitability of commercial banks in Ethiopia.

1.5 Scope of the research

The study covers Commercial Banks licensed by the National Bank of Ethiopia and employed financial innovation. The commercial banks that formed the units of analysis of the study are those that are in operation by close of business on 31st of June 2017.The financial innovations that are used in the study are Mobile banking, Automated teller machines (ATM), New Saving Accounts, point of sale terminals (POS), debit cards and Managerial Efficiency. The financial performance of commercial banks measured with profitability by using return on assets (ROA). The study utilizes secondary data collected from 9 commercial banks in Ethiopia that applied ATM, POS and Mobile banking since 2015. The research takes the sample beginning from year 2015 in order to increase the number of cross section which satisfies the sampling criteria. Therefore, nine commercial banks data from 2015-2017 were used to examine the effect of financial innovation on the financial performance of the Ethiopian commercial banks.

1.6 Significance

This study will add more knowledge on the concept of financial innovation and give more empirical findings on the relationship between financial innovation and performance. This will provide more literally material which will be of value to scholars, students and researchers. This study can also be used as a basis of further researches and also in academics in the area of financial innovation. This study will provide an insight on the effect of financial innovation on financial performance. This will provide management of commercial banks and firms of Ethiopia in financial services with more insight on the importance of financial innovation.

1.7 Limitation of the study

Secondary data was collected for 3 years from 2015 to 2017. The study takes only 3 years in order to increase the number of cross section to be studied and include some other new variables that are new saving account and mobile banking which are never been studied in Ethiopia.

The study cannot encompass all commercial banks which adopt financial innovation. Some of

commercial banks which applied financial innovation are omitted because of insufficient data on studied variables. Due to this factor the study covers only 9 commercial banks from the total of 17 commercial banks in Ethiopia based on the sampling criteria.

In the study only five variables (Mobile banking, ATM, New saving account, POS and Debit Card) are used in order to represent financial innovation. It cannot include some other variables like Electronic Fund Transfer, Agency Banking and Internet banking due later adoption of this financial innovation and absence of data.

1.8 Organization of the study

The study is organized in five chapters, chapter one discussed the introduction part Chapter two contains conceptual and theoretical framework and empirical studies literature. Chapter three discussed about the research methodology adopted in this study; Chapter four discussed about the data analysis and interpretation of the out puts. The final chapter (chapter five) present conclusion, recommendations and farther research suggestions.

Part Two: Literatures Review

2.1 Theoretical Literature

2.1.1 Schumpeter Theory of Innovation

Schumpeter (1934) cited by Korir (2014) and Ngumi (2013) argued that entrepreneurs, who could be independent inventors or R&D engineers in large corporations, created the opportunity for new profits with their innovations. In turn, groups of imitators attracted by super-profits would start a wave of investment that would erode the profit margin for the innovation. However, before the economy could equilibrate a new innovation or set of innovations, conceptualized by Schumpeter (1934) as Kondratiev cycles, would emerge to begin the business cycle over again. He emphasized the role of entrepreneurship and the seeking out of opportunities for novel value generating activities which would expand and transform the circular flow of income, but it did so with reference to a distinction between invention or discovery on the one hand and innovation, commercialization and entrepreneurship on the other. This separation of invention and innovation marked out the typical nineteenth century institutional model of innovation, in which independent inventors typically fed discoveries as potential inputs to entrepreneurial firms.

The author further saw innovations as perpetual gales of creative destruction that were essential forces driving growth rates in a capitalist system. Schumpeter's thinking evolved over his lifetime to the extent that some scholars have differentiated his early thinking where innovation was largely dependent on exceptional individuals/ entrepreneurs willing to take on exceptional hazards as an act of will. His later thinking recognized the role of large corporations in organizing and supporting innovation. This resulted in his emphasis on the role of oligopolies in innovation and which later was falsely viewed as the main contribution of his work (Freeman, 1994).

Schumpeter drew a clear distinction between the entrepreneurs whose innovations create the conditions for profitable new enterprises and the bankers who create credit to finance the construction of the new ventures. He emphasized heavily that the special role of credit-creation by bankers was 'the monetary complement of innovations' (Schumpeter, 1939). As independent agents who have no proprietary interest in the new enterprises they finance, bankers are the capitalists who bear all the risks (none is borne by the entrepreneurs). That requires having the special ability to judge the potential for success in financing entrepreneurial activities. Schumpeter emphasized that it is just as important to deny credit to those lacking that potential as it is to

supply credit to those having it (Schumpeter, 1939). According to Schumpeter, innovation does not mean invention rather it refers to the commercial applications of new technology, new material, new methods and new sources of energy.

2.1.2 Constraint-induced financial innovation theory

American economist Silber (1983) advanced constraint-induced financial innovation theory. This theory pointed out that the purpose of profit maximization of financial institution is the key reason of financial innovation. There are some restrictions (including external handicaps such as policy and internal handicaps such as organizational management and leadership style) in the process of pursuing profit maximization in an organization. According to Silber (1983), these restrictions and limitations not only guarantee the stability of management, they reduce the efficiency of financial institution, and so financial institutions strive toward casting them off. Constraint-induced innovation theory discussed the financial innovation from microeconomics, so it is originated and representative. But it emphasized innovation in adversity excessively. So it can't express the phenomenon of financial innovation increasing in the trend of liberal finance commendably.

Financial constraints significantly reduce the probability that a firm undertakes innovative projects. However, according to Silber (1983) financial innovation occurs to remove or lessen the constraints imposed on firms. Firms facing imperfections (e.g. regulation, entry barriers) have the greatest incentive to innovate and boost profits because of the high shadow costs of such constraints. Lerner (2006) finds that more highly leveraged firms are less innovative. He also reports that less profitable firms are significantly more innovative.

2.1.3 Transaction cost innovation theory

Hicks & Niehans (1983) cited by Korir (2014) the transaction cost innovation theory in the research on innovation. They thought that the dominant factor of financial innovation is the reduction of transaction cost, and in fact, financial innovation is the response of the advance in technology, which caused the transaction cost to reduce. The reduction of transaction cost can stimulate financial innovation and improvement in financial services. This theory studied the financial innovation from the perspective of microscopic economic structure change. It thought that the motive of financial innovation is to reduce the transaction cost. And the theory explained from another perspective that the radical motive of financial innovation is the financial institute's purpose of earning benefits. This theory discussed the motive and the process of financial

innovation from different sides.

2.1.4 Location innovation theory

Desai & Low (1987) with the location theory thought that financial innovation is the method, which can make the integrity of financial market come true. According to the Location Innovation Theory, they advanced the financial innovation microscopic economic model. Desai & Low (1987) utilized this theory to confirm and measure the gap in the scope of acquirable product in financial market, which indicates the potential opportunity of the new products innovation and promotion. Chen (1995) built the financial intermediary model in which new security secured by old security is created. In the period of decomposing the old securities and opening new market, innovators play an influential economical role. For example, investors can obtain the consumption at lower cost; investors can realize a better share of risks. His model indicated that even when introducing the surplus securities that are not distributed yet, the innovators can also play these roles. In other words, although these innovations have not changed the scope of acquirable financial tools, it makes investors trade at lower expected cost. The main focus is on security designing in incomplete financial markets. These theories will be applied to point in the way of explaining the impact of financial innovation on financial performance.

2.1.5 Task-technology fit (TTF) theory

Task technology fit (TTF) theory contends that information technology (IT) is more likely to have a positive impact on individual performance and be used if the capabilities of the IT match the tasks that the user must perform (Goodhue& Thompson 1995). Further, Goodhue& Thompson (1995, P.141) mentioned the factors that measure task-technology fit as; “quality, locatability, authorization, and compatibility, eases of use/training, production timeliness, systems reliability and relationship with users”. Their model is useful in the analysis of various context of a diverse range of information systems including electronic commerce systems and combined with or used as an extension of other models related to information systems outcomes.

According to TTF theory the success of an information system has a strong correlation between task and technology; hence success has been related to individual performance (Goodhue and Thompson 1995) and to group performance (Zigurs & Buckland 1998). For group support systems, a specific theory of TTF was developed Zigurs & Buckland (1998) and later tested by Wilson et al. (1999) and detailed the requirements of group support systems to fit group tasks. For

mobile information systems, TTF has been shown to be generally relevant, but more specific questions regarding the applicability of task technology fit to mobile information systems remain unanswered (Gebauer and Shaw 2004).

The theory of task-technology fit maintains that a match between business tasks and information technology is important to explain and predict the success of information systems (Goodhue and Thompson 1995; Zigurs & Buckland 1998). For various scenarios of task and technology, statistical significance has been established of a positive association between task-technology fit and information system success measures, such as use Dishaw & Strong (1999), and impact on individual performance Goodhue and Thompson (1995) and on group performance (Zigurset.al 1999). The concept of task technology fit promises to help identify aspects that are critical to support a given business task, and can, thus, contribute to the success of technology innovations (Junglas & Watson 2006). One such innovation is represented by mobile technology to support an increasingly mobile workforce (Barnes 2003).

2.2 Financial Innovation

Financial innovation can be defined as the act of creating and then popularizing new financial instruments as well as new financial technologies, institutions and markets. Innovations are new ideas that consist of: new products and services, new use of existing products, new markets for existing products or new marketing methods (Simmonds, 1986). Gubler (2011) defines financial innovation as a «process of change, a change in the type and variety of available financial products to be sure, but also a change in financial intermediaries and markets themselves. In the financial services industry, innovation is viewed as the act of creating and popularizing new financial instruments, technologies, institutions and markets, which facilitate access to information, trading and means of payment and to the emergence of new financial instruments and services, new forms of organization and more developed and complete financial markets. (Solans, 2003)

Adams and Romero (1981) defined financial innovations relatively narrow as any change in the operations of a financial intermediary. They argue that an innovation may be either cost decreasing or cost increasing for the intermediary and/or for the society. Frame and White (2002) define financial innovation as "...something new that reduces costs, reduces risks or provides an improved product/service/instrument that better satisfies participants' demands..." within a financial system. Schrieder & Heidhues (1995) take a much broader position, namely that innovations in the sense of technical progress comprise the development of new products (services) or changes in processes, institutions, and market systems that raise efficiency. It should

be pointed out that the cost decreasing effect of an innovative financial service, in practice, might be difficult to assess, particularly if the costs are shifted from the finance institution to the client. Thus, what may appear as a cost reduction for the lending institution may in fact be a shift of costs to another level.

2.3 Types of Financial innovations

According to White (2009-2010), technological advances in information processes have created many innovations in the financial services business and financial innovations that have taken place in the last 25 years are of different types and include new production processes, new products and services and new organizational forms.

2.3.1. Organizational/ institutional innovations

New bank organizational forms have emerged over the past few decades. The term financial institution innovation refers to changes in the structure, organization, and legal form of an institution (Johann, 1991). They may be caused or made possible by financial system changes. Financial institution innovations often seek to overcome legal and economic constraints on the extension of financial services to additional market segments, such as the rural poor. Such forms include:

Online Banking

Online banking, also known as internet banking, e-banking or virtual banking, is an electronic payment system that enables customers of a bank or other financial institution to conduct a range of financial transaction through the financial institution's website. According to Essinger (1999) is, "to give customers access to their bank accounts via a web site and to enable them to enact certain transactions on their account, given compliance with stringent security checks". Internet banking gives customers access to almost any type of banking transaction at the click of a mouse, except withdrawals. It is described as the provision of traditional (banking) services over the internet, by its nature offers more convenience and flexibility to customers coupled with a virtually absolute control over their banking.

Mobile Banking

Mobile banking is an application of mobile commerce which enables customers to access bank accounts through mobile devices to conduct and complete bank-related transactions such as

balancing cheques, checking account statuses, transferring money and selling stocks (Tiwari& Stephan 2007). Luo, Li, Zhang and Shim (2010), defined mobile banking as an innovative method for accessing banking services via a channel whereby the customer interacts with a bank using a mobile phone.

Mobile banking allows you to perform many activities like mini statement, checking of account history, SMS alerts, access to card statement, balance check, payment of bills, mobile recharge etc. using a Mobile phone or tablet. However, simply accessing the bank's website on a mobile device is not the only method of mobile banking. Mobile banking versatility includes: Logging into a bank's mobile website, using a mobile banking app and text message (SMS) banking.

Agency Banking

Agent banking is another institutional innovation; a bank agent is a retail or postal outlet contracted by a financial or mobile network to process client's transactions. Rather than a branch teller, the owner or an employee of the retail outlet who conducts the transaction and lets clients deposits, withdrawal, and transfer funds, pay their bills, inquire about an account balance or receive direct deposit from an employer. Banking agents can be pharmacies, supermarkets, convenience stores, lottery outlets, post offices, and many more (Kinuthia, 2010).

Agent banking means providing limited scale banking and financial services to the underserved population through engaged agents under a valid agency agreement, rather than a teller/cashier. It is the owner of an outlet who conducts banking transactions on behalf of a bank. Globally these retailers are being increasingly utilized as important distribution channels for financial inclusion.

2.3.2. Process Innovations

Processing innovations focus on improving organizational and service distribution aspects of financial institutions (Johann, 1991). These innovations are often associated with technological progress Data mining techniques used by the financial institution to identify credit worthy customers are an example. Financial innovation involves the profit generating application of new payment, communication and computing special payment and bank clearing methods (Kihumba, 2010)

Electronic Fund Transfer (EFT)

EFT (Electronic Funds Transfer) refers to the computer-based systems used to perform financial transactions electronically. EFT is safe, secure, efficient and less expensive than paper cheque

payment and collections. (Frame and White, 2009-10).It is a system of transferring money from one bank account directly to another without any paper money changing hands. One of the most widely-used EFT programs is Direct Deposit, in which payroll is deposited straight into an employee's bank account, although EFT refers to any transfer of funds initiated through an electronic terminal, including credit card, ATM, Fed wire and point-of-sale (POS) transactions. It is used for both credit transfers, such as payroll payments, and for debit transfers, such as mortgage payments.

Real Time Gross Settlement (RTGS)

Real-time gross settlement are specialist funds transfer systems where the transfer of money or securities takes place from one bank to another on a "real time" and on a "gross" basis. Settlement in "real time" means a payment transaction is not subjected to any waiting period, with transactions being settled as soon as they are processed. "Gross settlement" means the transaction is settled on one-to-one basis without bundling or netting with any other transaction. "Settlement" means that once processed, payments are final and irrevocable. (Basle, 1997)

RTGS systems are typically used for high-value transactions that require and receive immediate clearing. In some countries the RTGS systems may be the only way to get same day cleared funds and so may be used when payments need to be settled urgently. RTGS payments typically incur higher transaction costs and usually operated by a country's central bank.

Process innovations aim at reducing transaction costs and time and maintaining clients and better portfolio management so as to increase the overall firm's financial performance (Kihumba, 2008).They are often introduced to increase efficiency and expand market shares. Frequently, technological progress, such as computerization, lays the ground for a more efficient information, accounting, and data management, which then translate into process innovations at the financial institution level (Schrieder & Heidhues, 1995).

2.3.3. Product Innovations

Financial product innovations are defined as new or modified financial services that have not existed in the market before or differ substantially from existing services (Engel et al (1993), Christopher (1988) & Johann, (1991).This refers to the introduction of new or modified financial services, such as new credit, savings, insurance, leasing, hire purchase or other financial products (Kihumba, 2008). Product innovations may be introduced to better reflect the demands of the target clientele, to improve efficiency or to expand the institution's market and outreach. They can

be vital in securing the institutional viability of the financial intermediary (Schrieder & Heidhues, 1995).

Saving Account

Savings accounts are one suite which has experienced a great deal of evolution. Banks have come up with different savings accounts which are flexible and customer friendly and such accounts includes children account like special youth scheme account and modified youth scheme which encourage parents to open saving accounts for their children for long term benefits; hybrid accounts which are operated through check; current protection scheme accounts that links current and savings account of same customer so that cheques would not be bounced wherever the current account balance is not found adequate to cover the cheque amount and women's savings account to encourage and support women's, saving plus account, student account, salary account, Interest plus account and others this will reduce the number of unbanked population (Dashen Bank website and Fortune reporter, 2013). Current accounts have also not been left behind as the banks have tried to come up with current accounts that are attractive to their customers and put them ahead of the competitors (Koech, 2009).

Automated Teller Machine (ATM)

Automated Teller Machine (ATM) is the first well known machines to provide electronic access to customers. With the advent of ATM, banks are able to serve customers outside the banking hall. ATM is designed to perform the most important function of banks such as withdrawal of cash, deposits, printing of mini statements settlements of bills. It does all through an access to personal identification number (PIN), and aplastic that contains magnetic chip which the customers identified through (Olumide, 2014).

At first, a bank ATM could only be used by customers who had accounts in that bank, but in the early 1980s with the improvement in telecommunications, banks took advantage and started what is called shared ATMs networks where customers of other banks could access their money through other bank's ATMS. Banks paid other ATM owners "interchange" fees to cover the marginal cost of the "off us" transactions on the owner's machines. The ATMS were operated using an ATM card which was a magnetic card (Kinuthia, 2010).

Debit Cards

A debit card (also known as a bank card, plastic card or check card) is a plastic payment card that can be used instead of cash when making purchases. Unlike a credit card, the money comes

directly from the user's bank account when performing a transaction. Functionally, it can be called an electronic cheque, as the funds are withdrawn directly from either the bank account or from the remaining balance on the card. In some cases, the cards are designed exclusively for use on the internet, and so there is no physical card (Mavri & Ioannou, 2006).

Credit Cards

A credit card is a payment card issued to users (cardholders) to enable the cardholder to pay a merchant for goods and services based on the cardholder's promise to the card issuer to pay them for the amounts so paid plus the other agreed charges (Sheffrin, 2003). The card issuer (usually a bank) creates a revolving account and grants a line of credit to the cardholder, from which the cardholder can borrow money for payment to a merchant or as a cash advance. In other words, credit cards combine payment services with extensions of credit (Simkovic, 2008). Complex fee structures in the credit card industry may limit customers' ability to comparison shop, help ensure that the industry is not price-competitive and help maximize industry profits. Because of this, legislatures have regulated credit card fees (Simkovic, 2009)

Point of sale Terminals (POS)

According to Dieterich (2014), POS covers a variety of services rendered through machines located at retail establishments. POS terminals are generally clerk generated devices located at the checkout or convenience counter or retail establishment. Electronic cash register versions of these terminals have been in operation for several years, maintaining store records on sales, inventories, accounts receivable and the like. Now, POS devices have been linked to financial institution computers, allowing retail customers to receive approval for check cashing and electronically initiate transfers from their accounts to the retailer’s. In some installations, customers can make deposits to their accounts. POS devices accept either a plastic credit card or a plastic debit card, depending on whether the customer wants to delay payment by charging the purchase deducted directly from customer’s account. As electronic POS systems proliferate, their use will probably replace many of the paper transactions accomplished through cash payments and check and credit transactions.

2.4 Financial Performance

External parties normally evaluate a firm s ability based on its performance (Bonn, 2000). This implies why performance is like a mirror to a firm. The level of goal accomplishment generally defines a firm s performance (Achrol and Etzel, 2003). Firm performance is the outcomes

achieved in meeting internal and external goals of a firm (Lin et al., 2008). As a multidimensional construct, performance has several names, including growth, survival, success and competitiveness. The concept of firm growth was introduced in the early 1930s known as the Law of Proportionate Effect (sometimes called Gibrat's rule of proportionate growth). The Law of Proportionate Effect is frequently used as a benchmark for many studies to determine business growth. Gibrat's (1931) explains a firm s growth rate does not depend on the size of a firm.

Firm performance is a multidimensional construct that consists of four elements (Alam et al. 2011). Customer-focused performance, including customer satisfaction, and product or service performance; financial and market performance, including revenue, profits, market position, cash-to-cash cycle time, and earnings per share; human resource performance, including employee satisfaction; and organizational effectiveness, including time to market, level of innovation, and production and supply chain flexibility.

Using organizational goals as a basis, different methods are adopted by different firms to measure their performance. This performance indicator can be measured in financial and non- financial terms (Bagorogoza and Waal, 2010; Bakar and Ahmad, 2010). Most firms, however, prefer to adopt financial indicators to measure their performance (Grant et al., 1988). Financial performance is a measure of how well a firm can use assets from its primary mode of business and generate revenues (Bessler et al., 2008). This term is also used as a general measure of a firm's overall financial health over a given period of time, and can be used to compare similar firms across the same industry or to compare industries or sectors in aggregation. There are many different ways to measure financial performance, but all measures should be taken in aggregation. Return on assets (ROA), average annual occupancy rate, net profit after tax and return on investment (ROI) are the commonly used financial or accounting indicators by firms (Tavitiyaman et al., 2012). Some other common measures are profitability, productivity, growth, stakeholder satisfaction, market share and competitive position (Bagorogoza and Waal, 2010).

Generally, Performance measures can play the key role in initiating or implementing technological innovations and organizational change through incentives for improving performance and measurements to evaluate progress toward this goal. (Adam, 2014)However, financial elements are not the only indicator for measuring firm performance. It needs to combine with non-financial measurement in order to adapt to the changes of internal and external environments (Krager and Parnell, 1996).

2.5 Financial innovation in Ethiopia

Banking in Ethiopia started in 1905, the "Bank of Abyssinia", was established based on the agreement signed between the Ethiopian Government and the National Bank of Egypt, which was owned by the British. In 1908 SociteNationaled'Ethiope pour le Development Dei' Agricaltureet du and two other foreign banks (i.eBanque de l'Indochine and the Compagnie del' Afrique Orientale) were also established (Pankhrust, 1968). In 1931 the Ethiopian government purchased the Abyssinian Bank, which was the dominant bank, and renamed it the Bank of Ethiopia (Belay, 1990 & Befekadu, 1995). It operated for only a few years, being closed after the Italian invasion. During the Italian occupation, several Italian banks opened branches in Ethiopia. (Harvey, 1996) After the liberation in 1942, the State Bank of Ethiopia was established. It became operational in 1943. The Bank also acted as the country's main commercial bank, while a few much smaller foreign banks continued to operate.

In 1963, a new banking law split the functions of the State Bank of Ethiopia into central and commercial banking as the National Bank of Ethiopia and the Commercial Bank of Ethiopia respectively. The very interesting part of this law is it allowed other commercial banks to operate.

After the fall of the imperial government in 1974, since the remaining private sector commercial banks were relatively small; they were nationalized and concentrated into the Commercial Bank of Ethiopia (CBE). The new Ethiopian socialist government merely shifted, therefore, from owning most of the banking system to owning it completely (Harvey, 1996).

Even after the fall of DERGU regime, the financial sector reforms in Ethiopia do not allow private sector participation in existing government banks, nor do they allow the entry of foreign banks until 994.1994 is considered as another turning point in the history of banking business whereby local private commercial banks are allowed to operate in the country. Awash international bank S.C is the first indigenous private commercial bank in Ethiopia, which was established by 486 founder shareholders with a paid-up capital of Birr 24.2 million. It was licensed on November 10, 1994, and started banking operations on February 13, 1995.

Currently, the industry comprises one state-owned development bank and 17 commercial banks, one of which is state-owned, which is the dominant Commercial Bank of Ethiopia (CBE). After the merger of Construction and Business bank, with CBE that make the composition of the sector to two state owned banks; Commercial bank of Ethiopia and Development bank of Ethiopia and 16 private commercial banks. The private commercial banks currently operating in Ethiopia

alphabetically: Abay bank, Addis International Bank, Awash International bank, Bank of Abyssinia, Birhan International bank, Buna International bank, Cooperative bank of Oromia, Dashen bank, Debub global bank, Enat bank, Lion International bank, Nib international bank, Oromia International bank, united bank, Wegagen bank, and Zemen bank (www.nbe.gov.et). Broadly speaking, the banking industry in Ethiopia provides products mainly deposit facilities, loans and advances, local transfers, foreign letter of credit facilities, etc. These are traditional commercial banking businesses. (Gashayie & Singh, 2016)

The underdevelopment of the banking industry can be seen in the small proportion of the population that has a deposit account, less than 8 percent. (IMF, 2013) This underdevelopment restricts economic growth because it dramatically reduces the ability of the banking industry to offer savings products, which in turn hinders greater bank lending to business and entrepreneurial developments (Keatinge, 2004).

The introduction financial innovation began in late 2001, when the largest state owned; commercial bank of Ethiopia (CBE) introduced ATM to deliver service to the local users and followed by Dashen bank. By the end of 2008 Wegagen Bank has signed an agreement with Technology Associates, a Kenyan based information technology firm, for the development of the solutions for the payment system and installation of network of ATM. United Bank launch ATM service in collaboration with Awash International Bank and Nib International Bank in the year 2012 later joined by Birhan International Bank, Addis International bank and Cooperative Bank of Oromia. Finally, most of the banks introduce ATM and use the most popular Visa and Master cards in order to access this ATM and POS terminals. In Addition, Dashen Bank launched Ethiopia's first American Express debit card in April, 2016.

Binyam (2009), claimed United Bank being the first to introduce telephone and internet banking systems including text messages (SMS) by the end of the year 2008. While Zemen Bank, the only Ethiopian bank anchored in the idea of single branch banking, by launching full-blown internet banking in 2010, which is new to Ethiopian banking industry (Asrat, 2010). As Mattwos (2016) concluded that most banks are not sufficiently adopted the latest e-banking channel such as internet and mobile banking and are using traditional services to reach and serve their clients.

Agent banking is an innovation type, which targets the rural population to deliver banking services for the unbanked society through technological advancement, using the mobile technology. Agency banking system is not well adopted by Ethiopian banking industry due to lack of suitable legal frameworks, low level of ICT infrastructure, lack of customers trust and awareness towards the technology and customers' fear to use the technologies that holds banking industry to adopt the

system. (Afework, 2015)

Dashen Bank S.C pioneered in Agency banking service in December 2014 which named as "Endebank". Followed by United Bank, this is one of the pioneers. United Bank started the service on March 1, 2014 named Hibir Agent Banking. Unlike, Hibir Agent banking which is only available through United Bank; Hello Cash is available at LIB, Somali Micro Finance Institution (SMFI) and the Cooperative Bank of Oromia (CBO). Hello Cash is a mobile and agent banking service provided by Lion International Bank S.C in which the bank obtained its license in July 2015. Mobile and agent banking is a form of branchless banking which allows people to access bank accounts and retail outlets of merchants, by using a mobile phone device. Unlike Hibir and Hello Cash, M-Birr, an agent banking service provider, works with five different micro finance institutions, Tigray, Amhara, Oromia, Addis and the Omo micro finance institution in the Southern Nations, Nationalities Saving & Credit. M-Birr, through its 1,547 agents, is a key player in the new game in town. By 2015, it facilitated 273,620 transactions and has served almost 50,000 account holders. (Fortune, 2016) Oromia International Bank S.C (OIB) began the installation of agent and mobile banking system on March 3, 2015,

Financial innovation in Ethiopia banking industry is less developed from regional peers for example Kenya has 5.2 commercial bank branches and 9.5 ATMs per 100,000 adults, in contrast with Ethiopia's 2.0 and 0.3, respectively. (World Bank, 2013) There is no clearly established legal system to control the participants in the electronic payment system. (Fyery, 2008)

In general, banks in Ethiopia are trailing behind in acquiring the required quality of banking services to effectively compete in the global market. ATM, Credit Card and debit card services, internet banking, mobile banking and other electronic payment systems are at infant stage. The most dominant innovation channel among those banks, which are currently providing the service, is ATM card (Mattewos, 2016). Ayana, (2012) and Rahel, (2015) Concluded that the benefits of technological innovation are well known to the banks and represent a formidable force to drive adoption and implementation of the system. High customers demand, improvement in the banking habit of the society, late adopter of E-banking in technology in Ethiopia, commitment of the government to facilitate the expansion of ICT infrastructure and commitment of the government to strengthen the banking industry are among the major existing opportunities for the adoption and growth of E-banking technology in the country. (Kassahun, 2016)

2.6 Empirical Research

2.6.1 Empirical studies on developed and emerging market countries

Various studies have been conducted into the relation between financial innovation and bank performance. These studies have mostly resulted in findings that suggest a positive relationship between innovation and profitability. Most of these studies measured financial innovation against the return on assets (ROA) or return on equity (ROE). It is important to note however that research on financial innovation are relatively in the beginning stages and have no or inadequate systematic evidence with globally accepted results.

On the study conducted in 23 developed and developing countries by Akhisar et al (2015) found that POS terminal and Internet banking have positive impact on profitability of banks while number of issued bank cards (credit cards, debit cards, etc.) and the ratio of ATM to the number of branches is highly significant to profitability of 23 developed and developing countries. The study use ROE and ROA as dependent variable to measure profitability while number of cards(Debit card and Credit card), number of POS, the ratio of branch to number of ATM and number of customer enrolled in Internet banking as explanatory variables. The study cover nine years from 2005-2013 by using dynamic panel method.

Damanpour (2001) conducted a research entitled "The dynamics of the adoption of production and process innovations in organizations". The research conducted to examine the questions: which type of innovation is more readily adopted? Does the adoption of one type of innovation lead or lag the adoption of the other type? And, would the pattern of adoption of innovation types have an effect on organizational performance? Data was collected from101 commercial banks in United State for the period of covering from 1982-1993. Primary data was collected through questioner and telephone, secondary data also used collected from Onesource™. 31 type of innovation was analyzed in this research which is totally categorized in to product and process innovation by experts based on the definition of product and process innovation. From total of 31 innovation 17 was categorized as product innovation (ATMs (on bank premises), ATMs linked to statewide networks Debit cards, Credit cards, NOW/Super NOW accounts, Zero balance disbursement account Sweep (asset management) account Self-directed IRA account, Linked certificates of deposit Money market deposit, Adjustable rate mortgage, Mortgage equity account, Discount brokerage services Mutual funds, Direct payroll deposit, Lock box and Personal banker) and the rest 14 was process innovation (Truncation of check handling process Automated mortgage

generation Computerized loan document generation On-line teller terminals, Derivatives (swaps, options futures/forwards) Lobby automation (video banking), Automated voice response systems, High speed image processing of checks, High speed image processing of office documents Automated check reconciliation systems, Loan tracking system (retail), Risk management systems (tracking a bank's financial exposure) and Customer information file Treasurer work station). Financial performance was measured in ROA and ROE. The findings shows that product innovations are adopted at a greater rate and speed than process innovations, a product–process pattern of adoption is more likely than a process–product pattern, the adoption of product innovations is positively associated with the adoption of process innovations; and high-performance banks adopt product and process innovations more evenly than low-performance banks.

A study conducted by Scott et al. (2010) examines the impact of large financial network innovation on bank performance, specifically SWIFT (the Society for Worldwide Interbank Financial Telecommunication. SWIFT is a messaging data carrier for interbank communications. The study covers over 7000 banks over a seven-year period – 1998 to 2005. According to the findings of the research, there is enough evidence to show that the adoption of SWIFT has a positive and significant relationship with profitability. This is partly due to reduction in transaction and operational costs. However the returns are not realized immediately. It could take up to ten years to fully realize the benefits of SWIFT adoption. On the national or international level, the adoption of SWIFT has greatly improved international trade.

Mabrouk and Mamoghli (2010) in their study on Dynamics of Financial Innovation and Performance of Banking Firms: Context of an Emerging Banking Industry, analyzed the effect of the adoption of two types of financial innovations namely; product innovation (telephone banking and SMS banking etc) and process innovation (Magnetic strip card (debit, ATM and credit card), Automatic cash dispenser; (Automatic teller machine; Electronic payment terminal etc) on the performance of banks. Their analysis included two adoption behaviors, first mover in adoption of the financial innovation and imitator of the first movers. They found out that first mover initiative in product innovation improves profitability while process initiative has a positive effect on profitability and efficiency. Banks that imitate are less profitable and less efficient than first movers.

Berger (2003) conducted a study in United State to examine the effects of technological progress in the banking industry. The research concluded that the use of technology, including the shift to IT-based delivery systems like ATMs and Internet banking and the proliferation of financial

technologies such as financial derivatives and off-balance sheet credit commitments shows improvements in bank performance and consolidation of the industry during the deployment of new technologies, although establishing the links between technological progress and both banking industry productivity growth and industry structure require multivariate analyses.

(Sujud and Hashem, 2017) concluded that bank innovations potentially leads to higher profitability and higher return on assets of commercial banks in Lebanon. The study cover many bank innovation variable mobile banking, debit and credit cards, automated machines (ATM), internet banking, point of sale terminals (PST) and electronic funds transfer (EFT) as explanatory variable and profitability and ROA as dependent variable. Their findings shows that electronic funds transfer has a significant impact on the profitability of Lebanese commercial banks. However, ATM, point of sale terminals, debit cards, and Internet banking do not have any significant impact on the profitability of Lebanese commercial banks. In addition, debit and credit cards have a significant impact on the return on assets of Lebanese commercial banks. However, the other innovations of the bank are not significant like internet banking, mobile banking, and electronic funds transfer since it need large primary investment expenses. Finally, the researchers concluded that bank innovations affect profitability and return on assets (ROA) of commercial banks in Lebanon positively.

2.6.2 Empirical studies in Sub-Saharan Africa countries

Gakure and Ngumi (2013) conducted a study to determine whether bank innovations influence profitability of commercial banks in Kenya. The results of the study showed that innovations have a somewhat moderate effect on the profitability of the commercial banks in Kenya. The analysis showed the 47.8% of the variation in bank profitability was explained by financial innovations. However, it was determined that a single innovation did not have significant impact on bank profitability. Banks were thus better of adopting a combination of financial innovations to add a meaningful or significant contribution to the profits.

Agboola (2006) in his study on Information and Communication Technology (ICT) in Banking operations in Nigeria using the nature and degree of adoption of innovative technologies; degree of utilization of the identified technologies; and the impact of the adoption of ICT devices on banks, found out that technology was the main driving force of competition in the banking industry. During his study he witnessed increase in the adoption of ATMs, EFT, smart cards, electronic home and office banking and telephone banking. He indicates that adoption of ICT improves the banks' image and leads to a wider, faster and more efficient market. He asserts that it is imperative

for bank management to intensify investment in ICT products to facilitate speed, convenience, and accurate services, or otherwise lose out to their competitors.

Malak (2013) conducted a research on the effects of financial innovation on the financial performance of commercial banks in South Sudan. Casual research methodology was used to study on 16 commercial Banks registered with the central bank of South Sudan for 2009- 2013. Return on Equity (ROE) was used to measure financial performance and the number of Transactions done using ATM per day (Withdrawals, deposits), the number of transactions done using a phone per day (paying bills, accessing the account (update, checking the balance), borrowing and depositing and The Amount of Money borrowed using internet transactions.The finding shows that there is a positive and moderate linear relationship between the number of daily transactions using ATM and financial performance of commercial banks in South Sudan. The number of daily transactions using phones showed positive but very weak relationship with the financial performance of the commercial banks. Money borrowed showed weak but negative relationship with the financial performance with the commercial banks. The study concluded that financial innovation is significant and has a positive impact on the financial performance of the commercial banks in South Sudan.

Zewdie (2013) carried out a study on effect of financial innovation on the financial performance of commercial banks in Kenya. The population of the study consisted of all 43 commercial banks in Kenya. The primary data for the study was collected in questionnaire and secondary data was collected using publication, annual financial statement reports of commercial banks on the website and the bank supervision annual report from 2006- 2012 which was organized by the Central Bank of Kenya. The actual effect of financial innovation on financial performance was measured by regressing ROA and ROE against 12 financial innovations. The main findings of the study were financial innovations such as number of ATM cards, number of credit cards issued to customers, Number of debit cards issued to customers, number of minor/children account, number of special deposit account, number youth oriented account, and number of customers registered for e-banking and number customers registered for mobile banking and number of agency banking had imposed ROA of the bank studied. Therefore, concluded that financial innovation shows significant positive effect on the performance of banks in Kenya.

Paul et al (2015) conducted a study to assess the impact of financial innovations on the profitability of banks in Ghana. It was a case study carried out on Fidelity Bank Ghana Limited. Data for the research was gathered from the Income Statements of the bank within the period of five years 2009-2013 and analyzed by measure of profitability. Return on Equity (ROE) was used

to measure of profitability and financial innovation was also assessed using the bank's number of branches and number of automated teller machines (ATMs) over the period. Variables such as inflation and exchange rate of the domestic currency against US Dollar over the period were used as control variables for the study. The findings show that both the number of branches and the number of ATMs have a positive relationship with the bank's ROE and concluded that increase in the level of financial innovations, ultimately leads to an increase in the profitability of a bank in Ghana.

Saifullahi and Abubakar (2013) conducted a study to examine the impact of Information and Communication Technology and Bank Performance in Nigeria. Secondary data from the bank's annual financial reports and various issues of Fact books from Nigerian Stock Exchange in the form of panel covering the period 2001 – 2011 have been used. Net profits and Return on Equity (ROE) were used as a dependent variable and explanatory variables were number of ATM devices and volume of transaction on e-banking services of the selected commercial banks. The study concludes that cautious application of ICT apparatus will continue to enhance commercial banks performance in the country unless otherwise disrupted by externalities.

The relationship between financial innovation and growth in profitability of Islamic banking in Kenya was conducted by Muia (2013). The objective of the study was to assess the relationship between financial innovation in Shariah compliant financial products and services and profitability of Islamic banking in Kenya. The study gathered both primary and secondary data collected from eight commercial banks that operate Islamic banking in Kenya covering period between 2009 and 2012. ROA was used to measure profitability and financial innovation was measured by Number of Islamic debit and credit cards issued by Islamic banks, Contribution of agency banking, internet banking and mobile banking to income generated from Islamic banking, Number of new Shariah compliant financing facilities, Maintenance cost of Islamic debit and credit cards and Margin generated from Islamic debit and credit cards. The regression analysis on each of Islamic banking innovations above individually against the bank's profitability (ROA) revealed that there is a very weak relationship between individual innovations and profitability. However, bank innovations have a moderate influence on profitability of Islamic banks in Kenya in general. That shows 56.8% of variations in profitability of Islamic banks in Kenya is explained by bank innovations.

The study which is conducted by Gichungu & Oloko (2015) entitled "Relationship between Bank Innovations and Financial Performance of Commercial Banks in Kenya". The study was conducted in 43 commercial banks found in Kenya by using secondary data from annual report for five years from 2009-2013. ROA was used to measure financial performance of commercial banks

while the ratio of total investment to operating profit of mobile baking, the ratio of total investment to operating profit of ATM baking, the ratio of total investment to operating profit of Online baking and the ratio of total investment to operating profit of Agency baking were used as independent variable. The research concluded that mobile banking, online banking, agency banking and ATM banking have a positive impact on financial performance of banks. However, online banking as a bank innovation has not had the expected level of positive impact on the financial performance of commercial banks in Kenya.

2.6.3 Empirical studies in Ethiopia

In the context of Ethiopia there are many researchers studied in the area of e-banking. However, only two researches were studied to examine the effect of e-banking on financial performance. Most researches are conducted in the adoption of e-banking, challenges and opportunities of e-banking adapting E-banking and customer satisfaction on e- banking services.

Ayana (2014) undertake a research entitled "factors affecting adoption of E-banking system in Ethiopian banking industry, focused on factors that affect adoption of E- banking in Ethiopian banking industry". The study conducted on purposely selected four commercial banks in Ethiopia three private banks (Dashen bank, Zemen bank and Wegagen bank) and one state owned bank (commercial bank of Ethiopia).The study used both qualitative and quantitative research approach on a research framework developed based on Technology Organization Environment mode (TOE). And conclude E-banking system such as ATM, mobile banking, internet banking and others were not well adopted by Ethiopian banking industry, due to low level of ICT infrastructure and lack of legal frameworks at NBE. In addition to this the result of the study also showed that security risk and lack of trust on the use of technological adoption are other major barriers for the system. Limited technical and managerial skills available in Ethiopian banks were also mentioned as an influential factor for the choice of technology in Ethiopian banks.

Gardachew (2010) conducted a study on practices, opportunities and challenges of E- banking in Ethiopia, analyzed the main challenges and opportunities of E-banking. After conducting a survey he came up with the challenges being low level of internet penetration and poorly developed telecommunication infrastructure, lack of suitable legal and regulatory framework for e-commerce and e-payment, high rates of illiteracy, high cost of internet, absence of financial networks that link different banks, lack of reliable power supply and cyber security issues. And mentioned opportunities offered by ICT through e-learning programs, the help of nongovernmental agencies like ECA and World Bank to developing countries to design national strategies like e- commerce

and commitment of the government on ICT as prospects for E-banking development.

According to the study of Rahel (2015) which entitled" Barriers and Benefit of E-banking in Ethiopia" concluded that the major barriers Ethiopian banking industry faces in the implementation of E-banking are technology infrastructure being not easily available and low level of telecommunication network, lack of participation of employees in the implementation process, lack of training, absence of management support, lack of government support and absence of legal framework. The study also revealed direct and indirect benefits from E-banking implementation which are low cost in performing transaction, high speed and efficiency in service delivery, increased productivity and profitability of banks and improvement in customer service. The study was conducted based on the data gathered from seventeen commercial banks on a research framework developed based on technology-organization-environment (TOE).

By using both primary and secondary qualitative data gathered from all commercial banks Mattewos (2016) conducted a research entitled Challenge and prospect of E-banking service in Ethiopia. Explanatory research design was employed and descriptive method was used to analyze the collected data. The finding shows that the major practice of e-banking in those banks that are providing the service to their customer are balance inquiry, cash withdrawal, funds transfer within same bank and statement printings. And in order to provide this service commercial banks use different e-banking channels which are ATM, debit card, Internet banking and Mobile banking. In addition to this some banks start to provide different type of card services. The driving forces that initiate banks to adopt e-banking services are: existence of high competition in the banking industry, desire to improve organizational performance, desire to reduce transaction cost, desire to cover wide geographical area, and desire to build organizational reputation are among others. Chances of risk, Lack of suitable legal and regulatory framework, absence of financial networks that links different banks, Low level of internet penetration and poorly developed telecommunication infrastructure, high cost of internet, security concerns are among the major challenges of e-banking service in the country. However, late adopter opportunities, improvement in the banking habit of the society, commitment of the government to facilitate the expansion of ICT infrastructure and willingness among banks to cooperate in building infrastructure are the major opportunities for the adoption of the system in the banking industry. In addition, to this the same finding was gained from the study conducted in the same title by Kassahun (2016) which is conducted on six private commercial banks in Ethiopia.

Abebe (2016) conduct a research Opportunities and challenges in the adoption of E- banking service: in case of Dashen bank S.C. the employed survey method and simple random sampling

technique was used to take sample from the Dashen Bank clerical staff. The data was analyzed using linear regression model and the finding shows that perceived usefulness, perceived risk and environmental factors were found to have significant influence in adoption of E-banking services in Dashen bank. And also it revealed areas of improvement with possible solutions that mitigate the identified major challenges, which includes continuous reviewing and up grading of the existing security system, emphasis for appropriate promotion, and collaboration with other banks to have government support especially to the environmental factors of ICT infrastructure.

The impact of e-banking service on customer satisfaction was studied by Sintayehu (2015). The study was undertaken on selected private and public commercial banks in Addis Ababa. The Primary data which was collected by using 5-point Likert-scale questionnaire and interview with branch managers and customer service supervisors was analyzed by multiple linear regressions models. The study concluded that service quality dimensions, reliability, customer support and ease of use have strong influence one- banking user's satisfaction level in both public and private commercial banks in Addis Ababa.

Tilahun (2016) conducted a study to examine the effect E-banking on financial performance of commercial banks in Ethiopia. In this study which cover from 2013-2015 in 10 commercial banks in Ethiopia the research take three variables Number of ATM, Number of POS and Number of Debit cardholders as an independent variable to represent e- banking while profit before tax and ROA are used as dependent variable to measure profitability. Finally, concluded that electronic banking had statistically significant impact on return on assets and profitability of commercial banks of Ethiopia.

In addition Solomon (2016) conducted a research entitled the role of Electronic banking on financial performance of commercial banks in Ethiopia. This study also covers 3 years from 2013-2015 in 10 commercial banks in Ethiopia. Using ROA as dependent variable in the study explanatory variable were value or price of transaction of ATM, value or price of transaction of POS, debit card, number of automated teller machine terminals, number of point of sale terminal and market share of banks while market share is a control variable. The finding shows that increased number of ATM, POS and market share had a positive role on the financial performance of commercial banks while the number of debit card had negative role on the financial performance of commercial banks. In addition, value or price of transaction of ATM and value or price of transaction of POS became insignificant to financial performance of commercial banks in Ethiopia.

2.7 Research Gap

From the foregoing review of relevant literature, it is evident that research in the area of financial innovations has been done but not in a comprehensive approach. Most of the literature reviewed indicates that previous researchers only concentrated on e-banking adoption, Barriers and Benefits, Challenges and Prospect, customer satisfaction and behavior towards e-banking in Ethiopia. From survey of relevant literature, it has been found that there are only two studies Tilahun (2016) and Solomon (2016) to Ethiopia on the link of e banking and financial performance of commercial banks. However, these studies concentrate on a few variables of innovations while this study covers additional important variables that were omitted by previous studies like mobile banking and Internet banking. This makes the study more comprehensive. This study therefore intends to fill these pertinent gaps in literature by studying the effects of financial innovations on financial performance of commercial banks in Ethiopia.

2.8 Conceptual Framework

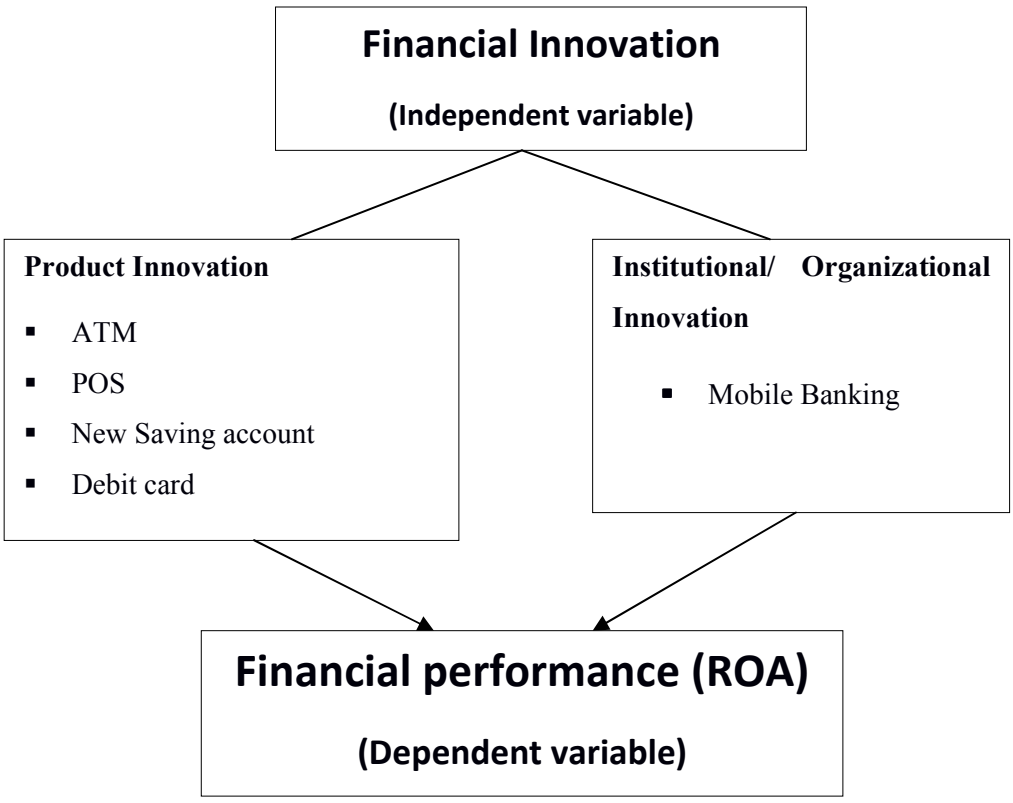


Figure 2.1: Conceptual framework

Part Three: Research Methodology

3.1 Research Design

A research design expresses both the structure of the research problem and the plan of investigation used to obtain empirical evidence on the relations of the problem (Kerlinger, 1986).The primary aim of this study is to examine the impact of financial innovation on financial performance commercial banks in Ethiopia. To achieve this objective explanatory research design with a quantitative approach is used. Hence, explanatory research design enabled the researcher to examine the effect of financial innovation on financial performance of commercial banks in Ethiopia.

3.1.1 Target Population and Sampling Techniques

Target population is the population to which a researcher wants to generalize the results of the study (Mugenda & Mugenda, 2003). According to Malhotra (1999), population is the aggregate of all the elements that share some common set of characteristics and that comprise the universe for the purpose of the research problem. The target population is seventeen (17) commercial banks of Ethiopia namely Abay bank, Addis International Bank, Awash International bank, Bank of Abyssinia, Berhan International bank, Buna International bank, Commercial Bank of Ethiopia, Cooperative bank of Oromia, Dashen bank, Debub global bank, Enat bank, Lion International bank, Nib international bank, Oromia International bank, united bank, Wegagen bank, and Zemen bank. From those CBE is state owned and the rests are private commercial banks.

Banks those have organized financial innovation service report to NBE since 2015 are considered as a sample. Due to this reason, by using purposive sampling technique from seventeen Commercial banks operating in Ethiopia this study take nine banks which are the banks that have invested heavily in financial innovation based on information available. Those are:-

- Abay Bank Share Company
- Awash International bank Share Company
- Berhan International Bank Share Company
- Bank of Abyssinia Share Company

- Commercial bank of Ethiopia Share Company
- Dashen Bank Share Company
- Nib International bank Share Company
- United Bank Share Company and
- Wegagen Bank Share Company

3.1.2 Source and Type of data

The study take a quantitative research approach by using secondary data gathered from selected commercial banks and published annual reports of commercial banks from company official website. This study will use panel data covering a period of 3 years (2015 to 2017). The Panel data involves the pooling of observations on a cross section of units over several time periods and provides results that are simply not detectable in pure cross sections or pure time series studies (Brooks, 2008).

Brooks (2008), states that panel data set has two major advantages; first, it can address a broader range of issue and tackle more complex problem than pure time series or pure cross-sectional data alone and by structuring the model in appropriate way, the researcher can remove the impact of certain forms of omitted variable bias in the regression result. Second, it is often examined how the relationships between variables change. Hence, by combining cross-sectional data and time series data, the researcher can increase the number of degree of freedom, and thus the power of test, by employing information on the dynamic behavior of a large number of entities at same time.

3.1.3 Data Analysis

In this study, quantitative data was gathered from selected commercial banks and banks annual reports. After that, collected data was rearranged, edited and calculated in order to become complete data that is needed for this study. Next, the collected panel data was analyzed using descriptive statistics, and multiple linear regression analysis. The descriptive statistics (Mean, maximum and minimum values and standard deviations) was used to analyze the general trends of the data from 2015 to 2017. A multiple linear regression model was used to determine the relative importance of each independent variable in explaining the variation financial performance of commercial banks in Ethiopia. The multiple linear regressions model was conducted by the

ordinary listing square (OLS) method using E-views 9 econometric software package.

According to Brooks (2008), ordinary least squares (OLS) or linear least squares is a method to estimate the slope and intercept in a linear regression model. This study used an ordinary least squares (OLS) regression to estimate the linear equation. The rational for choosing OLS is that, if the Classical Linear Regression Model (CLRM) assumptions hold true, then the estimators determined by OLS will have a number of desirable properties, and are known as Best Linear Unbiased Estimators (Brooks, 2008). In addition, as noted in Petra (2007) OLS outperforms the other estimation methods when the following holds; the cross section is small and the time dimension is short. Therefore, as far as both the above facts hold true in this study it is rational to use OLS.

Diagnostic checking is done to test whether the sample is consistent with the CLRM assumptions:

Assumption 1: $E(ut) = 0$

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 (Brooks, 2008). Since this equation includes constant number this assumption is not violated.

Assumption 2: $\text{var}(ut) = \sigma 2 < \infty$

This assumption state that the variance of the errors is constant and finite over all values this is known as the assumption of homoscedasticity. If the errors do not have a constant variance, they are said to be heteroscedastic (Brooks, 2008). 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 study, the popular white test was employed to test for the presence of heteroscedasticity. The hypothesis for the Heteroscedasticity test was formulated as follow:

H0: There is no Heteroscedasticity problem in the model.

H1: There is Heteroscedasticity problem in the model.

$\alpha = 0.05$

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

Assumption 3: cov(ui , $u\,j$) = 0 for i _= j

This is assumption states that assumption states that covariance between the error terms over time (or cross-sectionally, for that type of data) is zero. it is assumed that the errors are uncorrelated with one another. In the case of autocorrelation problem, the estimated parameters can still remain unbiased and consistent, but it is inefficient. The result of T-test, F-test or the confidence interval will become invalid due to the variances of estimators tend to be underestimated or overestimated. Due to the invalid hypothesis testing, it may lead to misleading results on the significance of parameters in the model. In this study to test for the existence of autocorrelation, the popular Breusch-Godfrey Serial Correlation LM Test was employed.

H0: There is no autocorrelation problem in the model.

H1: There is autocorrelation problem in the model.

$\alpha = 0.05$

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

Assumption 4: the xt are non-stochastic

Based on this assumption the repressors are not correlated. However, if one or more of the explanatory variables is contemporaneously correlated which is called multicollinearity .If the multicollinearity occurs, the regression model is unable to tell which independent variables are influencing the dependent variable. The consequences of Multicollinearity are large variances and covariance of OLS estimators, wider confidence interval, insignificant t ratio, high $R2$ but few significant t ratio, sensitivity of OLS estimators and their standard errors to small changes in data. There is no one unique method to detect the multicollinearity problem, it only have some rules of thumb, which are high $R2$ but few significant t ratio, high pair wise correlation coefficient and Variance Inflation Factor (VIF) or Tolerance (TOL). This study used high pair-wise correlation coefficients method to test the presence of multicollinearity problem in a regression model. Because it can see the correlation of independent variables between each other one by one. If the correlation coefficient was higher than 0.8, the model would be considered as it consists of serious Multicollinearity problem Guajarati (2004).

Assumption 5: the disturbances are normally distributed

Normality tests are used to determine if a data set is well-modeled by a normal distribution. With the normality assumption, ordinary least square estimation can be easily derived and would be

much more valid and straight forward. This study used JarqueBera Test (JB test) to find out whether the error term is normally distributed or not. The hypothesis for the normality test was formulated as follow:

H0: Error term is normally distributed

H1: Error term is not normally distributed

$\alpha = 0.05$

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

Model Specification test

According to Brooks (2008), Specification error occurs when omitting a relevant independent variable, including unnecessary variable or choosing the wrong functional form, so that regression model will be wrongly predicted. If the omitted variable is correlated with the included variable, the estimators are biased and inconsistent. If the omitted variable is not correlated with the included variable, the estimators are unbiased and consistent. Ramsey RESET test was used to see whether the developed model is correctly regressing.

H0: the model is correctly specified

H1: the model is not correctly specified

$\alpha = 0.05$

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

3.2 Model specification

Model specification refers to the determination of which independent variables should be included in or excluded from a regression equation. In general, the specification of a regression model should be based primarily on theoretical considerations rather than empirical or methodological ones. A multiple regression model is, in fact, a theoretical statement about the causal relationship between one or more independent variables and a dependent variable (Allen, 1997).

Model specification is the first and most critical stage of regression analysis; followed by estimation of parameters and interpretation of those parameters. Our estimates of the parameters of a model and our interpretation of them depend on the correct specification of the model (Allen,

1997). Regression analysis is also valuable for quantifying the impact of various simultaneous influences upon a single dependent variable. Further, because of omitted variables bias with simple regression, multiple regressions are often essential even when the researcher is only interested in the effects of one of the independent variables. Jackson (2009) stated that multiple regression analysis involves combining several predictor variables in a single regression equation. With multiple regression analysis, we can assess the effects of multiple predictor variables (rather than a single predictor variable) on the dependent measure.

Similar research topics with this research idea were conducted using OLS. For instance, Ngumi (2013) study conducted in Kenya that used OLS model to measure the financial performances of commercial banks used PBT as dependent variable. On the study conducted by Saifullahi and Abu-Bakr (2013) to assess the impact of ICT on financial performance of Nigeria banks; the study concluded that both E banking and ATM are positive and statically significant. Mohammad and Saad (2011) results a negative and significant relationship on E banking and financial performance of Jordanian banks by using OLS regression analysis. Nkem and Akujinma (2017) use OLS regression to assess the relationship between financial innovation and bank efficiency and impact of financial innovation on efficiency ratio of deposit money banks in Nigeria.

According to Brooks, (2008), the general multivariate regression model with K independent variables can be written as follows:-

$Yi = \beta_0 + \beta_1 X_1 i + \beta_2 X_2 i + \ldots + \beta_k X_k i + \varepsilon i$ (i 1, 2, 3…, n)

Where Yi is the i^{th} observation of the dependent variable, $X_{1i}.\ldots X_k i$ are the i^{th} observation of the independent variables, β0,…,βk are the regression coefficients, εi is the i^{th} observation of the stochastic error term, and n is the number of observations. Hence, the impact of financial innovation on financial performance of commercial banks can be model as follow:-

$ROA = \beta_0 + \beta_1 NMBi,t + \beta_2 ATMi,t + \beta_3 NSA\ i,t + \beta_4 POSi,t + \beta_5 NDCi,t + \beta_6 MGT.E + \varepsilon$

Where: - ROA- Return on Assets

NMB- Number of Mobile Banking users

NSA- Number of new saving accounts

ATM- Number of ATM

POS- Number of POS

NDC- Number of Debit Card users

MGT.E- Managerial Efficiency

β_o= Constant term

$\beta_{1, 2, 3...7}$ are parameters to be estimated;

Є = is the error component for company i at time t assumed to have mean zero E [Є it] =0

i = commercial banks i = 1. . . 9; and

t = the index of time periods and t = 1- 3

3.3 Variable Definition and Hypothesis Development

According to Creswell, (2009), to make it is clear to readers what groups are receiving the experimental treatment and what outcomes are being measured, the variables need to be specified in quantitative researches.

3.3.1 Dependent variable

Return on Asset (ROA)

In this study financial performance is measured by the profitability of the banks. Net income gives us an idea of how well a bank is doing but it does not adjust for the bank's size, thus making it hard to compare how well one bank is doing relative to another. A basic measure of bank profitability that corrects for the size of the bank is the return on assets (ROA). Return on Asset gauges how efficiently a company can squeeze profit from its assets, regardless of size.

Return on Asset (ROA) represents efficiency in asset utilization and shows how much net income is generated out of assets. It indicates the ability of bank management to generate profits by utilizing the available assets of the bank. Thus, if the ratio of ROA is high, it indicates that it is better performance in order to generate profit. It is measured by the ratio of net profit to total asset as follows:

ROA = Net Profit before tax / Total Asset

In most similar studies they use ROA as measure of financial performance as a single variable. Wachira (2013) on his study the effects of technological innovation on the performance of commercial banks in Kenya uses ROA as a single measure of financial performance. Other studies

like Sujid and Hashem (2017), Gichungu and Oloko (2015), Muia (2013) and Mugane(2015) uses Return on Asset to measure profitability of banks on similar study; the effect of financial innovation on financial performance of banks. In other studies Akhisar et al (2015)conducted on 23 different developed and developing countries and Paul (2015) conducted in Ghana to examine the effect of financial innovation on profitability use ROA jointly with ROE to measure profitability of banks.

3.3.2 Independent Variable

Financial performance of a bank is affect by a number of factors. In this study the researcher wants to examine the effect of financial innovation of banks financial performance. The independent variable financial innovation will be representing by a number of variables. However, for this study due to lack of data the variables that will be consider are Number of Mobile banking users, Number of ATM, Number of new saving Accounts, Number of POS terminal, Number of debit Card holders, and Management Efficiency.

3.3.2.1 Number of Mobile banking users (NMB)

In this study mobile banking is proxied as the number of customer uses mobile banking service. Kamau and Oluoch (2016) in their research entitled relationship between financial innovation and commercial bank performance in Kenya; they concluded that commercial banks have intensified their profitability by developing new products which are incorporated in operations and they have minimized operational costs and increased efficiency and consequently there profitability. For this study they have used the number of customer enrolled on mobile banking as an independent variable to see the effect on Return on Equity of commercial banks. Others like Mutua (2010), Kithaka (2011) and Chepkemoi (2015) use number of customer use mobile banking as a proxy to examine the effect of mobile banking in financial performance of commercial banks in Kenya.

NMB= Number of Mobile banking users

Muiruri and Ngari (2014) in the research conducted in Kenya finds that an increase in use of mobile banking increases the profits of commercial bank in Kenya. According to Gakure and Ngumi (2013) mobile banking has increased access to banking services and subsequently income and profits for the banks. The same conclusion was given by Gichungu and Oloko (2015), Ndungu (2015) and Ngumi (2013). Therefore, positive and significant relationship is expected between Mobile banking and financial performance of commercial banks in Ethiopia. As a result, the researcher formulates its hypothesis as follows:-

Hypothesis 1: Mobile Banking has positive and significant effect on profitability of commercial banks in Ethiopia.

3.3.2.2 Number of Automated Teller Machine (ATM)

Paul et al (2014) has done a research entitled "financial innovation and its impact on bank profitability: a Case study of fidelity bank Ghana limited". For this study, they have used return on asset and Return on Equity considering as dependent variables and the number of ATM machines, terminal branches, inflation and exchange rate were considered as independent variables. Results showed that the impact of financial innovation on financial performance of fidelity Ghana banks was great and very significant. Evidence from other empirical studies like Sum &Florence (2016), Saeid et.al, (2014), Nofie (2011), Kemppainen (2003), Mabrouk & Mamoghli (2010) which are conducted on the contribution of automated teller machines (ATM) to bank's profitability they used number of ATM terminals as an independent variables. Therefore, in this study ATM is proximate by total number of ATM terminals.

ATM=Total number of Automated Teller Machines

Kamau and Olouch (2016) find ATM has positive and significant effect on profitability of commercial banks in Kenya. This conclusion was consistence with Paul et al (2015) in Ghana, Akhisar et al (2015) in research conducted in 23 developed and developing countries, Gichungu and Oloko (2015) and Gakure and Ngumi (2013) in Kenya. However, the empirical evidence regarding the effect of ATM on profitability in Ethiopia is mixed. On a research conducted by Tilahun (2016) concluded that the number of ATM terminals increase the impact on profitability not attractive, or profitability would decrease. Since the cost of installation and price of ATM terminals compared to profit was too expensive. However, Solomon (2016) ATM has positive and significant effect for profitability of commercial banks in Ethiopia. The finding of most of the studies supports positive effect of ATM on profitability of commercial banks. As a result, the researcher formulates its hypothesis as follows:-

Hypothesis 2: ATM has positive and significant effect on profitability of commercial banks in Ethiopia.

3.3.2.3 Number of New Saving Accounts

Ngure et al (2017) in their study product innovation on financial performance of saving and credit cooperative societies in Kirinaya country, use new deposit account as one independent variable with debit card, credit card and electronic fund transfer to assess the effect of product innovation on return on asset, return on equity, net profit margin and profit margin which were used to measure financial performance of SACCO. In this study new deposit (saving) account is measured

by the number of new deposit (saving) accounts introduced.

Zewdie (2013) a research conducted in Kenya on title of financial innovation on financial performance of commercial banks concluded that number of minor/children account, number of special deposit account, number youth oriented account has positive effect on ROA of banks. In addition, Ngure et al (2017) in their study product innovation on financial performance of saving and credit cooperative societies in Kirinaya country, new deposit account has positive impact on financial performance of SACCO. Therefore, the researcher formulates its hypothesis as follows:-

Hypothesis 3: New Saving Account has positive and significant effect on profitability of commercial banks in Ethiopia.

3.3.2.4 Number of point of sale terminal (POS)

In this section POS is proximate by total number of POS terminals. Ngumi (2013) research conducted in Kenya on effects of innovation on financial performance of commercial banks in Kenya; Mabrouk & Mamoghli (2010) employed in Tunisia so called financial innovation for banks profitability; Nofie (2011) study on the diffusion of electronic banking in Indonesia and Kemppainen (2003) Competition and regulation in European retail payment systems used number of ATM terminals, number of POS terminals and number of debit card used as independent variables.

POS= Total number of Point of sales terminals

Sujud and Hashem (2017) on their research conducted in Lebanon concluded that POS, internet banking need large primary investment expenses and it initially have low-income margins and thus lesser contribution to return on assets (ROA). Akhisar et al (2015) in research conducted in 23 developed and developing countries concluded POS have negative effect on profitability due to high intimal investment. Tilahun (2016) and Solomon (2015) concluded that POS have a positive and significant effect on profitability of commercial banks in Ethiopia. Since the findings in Ethiopia have concluded a positive relationship between POS and financial performance of commercial banks in Ethiopia, the researcher formulates its hypothesis as follows:-

Hypothesis 4: POS has significant has positive and significant effect on profitability of commercial banks in Ethiopia.

3.3.2.5 Number of Debit Card holders

Akhisar et al (2015) research entitled effect of innovation on profitability. A research studied in 23 developed and developing countries by considering debit card, credit card, POS, ATM and Internet

banking. Debit card is proxied as total number of Debit card users. In similar researches Muia (2013) "entitled the relationship between financial innovation and growth in profitability of Islamic banking in Kenya" proxied debit card as the number of Debit card users. An also kamau and oluoch (2016) that conducted to determine the effect of mobile, internet, ATM, credit and debit cards, and agency banking on profitability measure both debit card and credit card by the number of customer used.

NDC= Total number of Debit Cardholders

Akhisar et al (2015) in research conducted in 23 developed and developing countries, Sujud and Hashem (2017) a study in Lebanon, Gakure and Ngumi (2013) and Kamau and Olouch (2016) have a consistence conclusion that debit and credit cards improved banks' income generation; since they have low initial investment cost. According to Tilahun (2016) Debit cards would have a positive influence on ROA of commercial banks in Ethiopia while Solomon (2016) concluded that Debit card has negative role on financial performance of the commercial banks. Therefore, debit card have positive effect is expected on financial performance of commercial banks in Ethiopia. As a result, the researcher formulates its hypothesis as follows:-

Hypothesis 5: Debit card has significant has positive and significant effect on profitability of commercial banks in Ethiopia.

3.3.3 Control Variable

Managerial Efficiency

The expense management variable, which is defined as the ratio of operating expenses to total income, provides information on variations in operating costs and it used as aproxy to measure the management quality of the bank. The total cost of a bank, excluding interest expense, includes operating cost and other expenses such as depreciation and taxes. From these only operating expenses can be viewed as the outcome of the bank management decision. Therefore, expense management is captured by the ratio of these operating expenses to total assets

Mgt. E= Operating Expense/total income

Managerial efficiency measures the cost of running a bank as a percentage of income, a high ratio of this reflects that the management of the bank is operationally inefficient in controlling costs. This will eventually have an undesirable effect on the profitability of the bank (Rao and Lakew, 2012). Tesfaye (2013) in the study determinant of commercial bank performance in Ethiopia

operational efficiency have negative relation with both ROA and NIM and statically significant for ROA and insignificant for NIM. On the study by Rao and Lakew (2012) on determinant of commercial bank performance in Ethiopia concluded that Managerial efficiency has negative significant effect on ROA. Therefore, based on the empirical evidence Managerial efficiency have expected to have a negative effect on financial performance of commercial banks.

Hypothesis 6: Managerial Efficiency has negative and significant effect on profitability of commercial banks in Ethiopia.

3.4 Operationalization of study variables

	Variable	Notation	Measure	Expected sign
Dependent variable	Return on Asset	ROA	Net income before tax/ Total Asset	
Independent variable	Mobile Banking	NMB	Natural logarithm of Number of Mobile Banking users	+
	Automated Teller Machine	ATM	Natural logarithm of number of ATM	+
	New saving account	NSA	Natural logarithm of Number of new saving Accounts	+
	Point of sales terminal	POS	Natural logarithm of Number of POS	+
	Debit card	NDC	Natural logarithm of Number of Debit Cardholders	+
Control Variable	Managerial Efficiency	Mgt. E	Ratio of Operating expense to total income	-

Table 3.1 Definition, notation and expected sign of the explanatory variables

Part Four: Data Analysis

4.1 Descriptive statics

Table 4.1 provides a summary of the descriptive statistics of the dependent and independent variables for nine commercial banks from the year 2015 to 2017 with a total of 27 observations. The table shows the mean, minimum, maximum, standard deviation and number of observations for the dependent variable Return on asset (ROA) and independent variables Number of Mobile banking users (NMB), Number of ATM (ATM), Number of new saving Accounts (NSA), Number of POS (POS), Number of Debit Cards (NDC) and Management efficiency (Mgt. E).

Table 4.1 Descriptive statics

	ROA	NMB	ATM	NSA	POS	NDB	MGT_E
Mean	0.032448	0.035033	0.028303	0.040558	0.028510	0.033749	0.387907
Median	0.032162	0.033770	0.028382	0.043686	0.026865	0.033012	0.399987
Maximum	0.048606	0.049552	0.045377	0.059640	0.047972	0.044502	0.451912
Minimum	0.022312	0.024067	0.008601	0.018814	0.014569	0.026728	0.230044
Std. Dev.	0.005930	0.005600	0.007834	0.013338	0.008500	0.004421	0.058120
Observations	27	27	27	27	27	27	27

Source: Eviews output

Table 4.1 shows the average indicators of variables computed from the financial statements and the standard deviation that shows how much dispersion exists from the average value. According to Brooks, (2008), a low standard deviation indicates that the data point tend to be very close to the mean, whereas high standard deviation indicates that the data point are spread out over a large range of values. It shows the summary data for the variables used in the analysis. The data are average values across years and reported showing the trend of the key variables over the period 2015 to 2017. The data shows that during 2015 to 2017 the average profit level; ROA of Ethiopian banks are 3.24 percent. And also the standard deviation is 0.0059 as indicated in table 4.1. This implies that the volatility of ROA ratio varies from the mean by 0.59%.

4.2 Regression model result

For valid hypothesis testing and to make data available for reliable results, the test of assumption of regression model is required. Accordingly, the study has gone through the most critical regression diagnostic tests consisting of Normality, Multicollinearity, heteroskedasticity, and autocorrelation and model specification accordingly.

4.2.1 CLRM assumptions

To maintain the data validity and robustness of the regressed result of the research, the basic classical linear regression model (CRLM) assumptions must be tested for identifying any misspecification and correcting them so as to augment the research quality Brooks, (2008). There are different CLRM assumptions that need to be satisfied and that are tested in this study, which are: errors equal zero mean test, normality, homoscedasticity, autocorrelation, and multicollinearity.

4.2.1.1 Test for heteroscedasticity assumption (var(ut) = σ2 <∞)

The condition of classic linear regression model implies that there should be homoscedasticity between variables. This means that the variance should be constant and same. Variance of residuals should be constant otherwise, the condition for existence of regression, homoscedasticity, would be violated and the data would be heteroskedastic Brooks, (2008). the presence of heteroscedasticity in OLS estimators will still give unbiased (and also consistent) coefficient estimates, but they are no longer best linear unbiased estimators (BLUE) – that is, they no longer have the minimum variance among the class of unbiased estimators Brooks, (2008). To check this, the popular white test was applied. In heteroskedastic white test the null hypothesis is that the variance of error term is constant. The test statistics give us the information we need to determine whether the assumption of homoscedasticity is valid or not, but seeing the actual auxiliary regression in the second table can provide useful additional information on the source of the heteroscedasticity if any is found (Brooks 2008). The result of the test is as follows:-

Table 4.2 Heterosckedasity test

Heteroskedasticity Test: White

F-statistic	1.800988	Prob. F(6,20)	0.1500
Obs*R-squared	9.470905	Prob. Chi-Square(6)	0.1488
Scaled explained SS	6.504981	Prob. Chi-Square(6)	0.3691

Source: Eviews output

In this case all the F-, Scaled explained SS and $\chi 2$ ('LM') versions of the test statistic give the same conclusion that there is no evidence for the presence of heteroscedasticity, since the p-values are considerably in excess of 0.05. Therefore, the null hypothesis of is failed to reject since the level of significance is more than 5% which means it homoscedasticity error term.

4.2.1.2 Test for absence of Autocorrelation

Another basic assumption of regression model says that the co-variance between error terms should be zero. This means that error term should be random and it should not exhibit any kind of pattern. If there exists co-variance between the residuals and it is non- zero, this phenomenon is called auto-correlation Brooks, (2008). To check this we can use different methods.

Durbin–Watson test

From the formal statistical test the simplest test is Durbin-Watson Brooks, (2008). Accordingly, the relevant critical values for 27 observations and 6 repressors in Durbin-Watson test statistic table have shown an upper critical value (dU) of 1.974 and a lower critical value (dL) of 0.925 which is an intermediate region where the null hypothesis of no auto-correlation can neither be rejected nor not rejected. Thus, as shown in table 4.6, the Durbin-Watson test statistic of this study (1.59) was clearly between the upper limit (1.974) and the lower limit (0.925) and thus the null hypothesis of no autocorrelation neither rejected nor not rejected. To mitigate this problem another method was used.

Breusch–Godfrey Serial Correlation LM test

The Breusch–Godfrey serial correlation LM test was run. Breusch–Godfrey tests area joint test for

autocorrelation that will allow examination of the relationship between uˆ t and several of its lagged values at the same time. According to Brooks (2008), The Breusch-Godfrey test is a more general test for autocorrelation up to the r^{th} order.

Hypothesis of this test are:-

Following the general null hypothesis of Breusch–Godfrey serial correlation LM test, the researcher develops the following hypothesis to check the absence of autocorrelation:

H0 = No autocorrelations errors

H1 = Autocorrelations errors

Table 4.3: Breusch-Godfrey Serial Correlation LM Test:

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.852678	Prob. F(6,14)	0.1602
Obs*R-squared	11.94987	Prob. Chi-Square(6)	0.0631

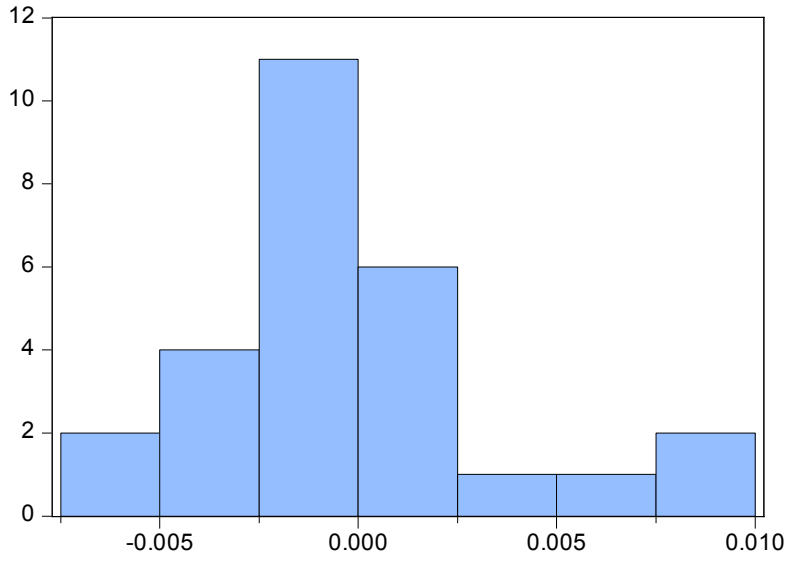
Source: Eviews output

As can be seen in the above table 4.3 F test result and the P value of F-statistic 0.1602 which is was beyond the significance level of 5%. Hence, the null hypothesis of no autocorrelation is failed to reject at 5 percent of significant level. This implying that there is no significant evidence for the presence of autocorrelation in this model.

4.2.1.3 Test for Normality (ut ~N(0, σ2))

In this study, the normality of the data was checked with the popular Bera-Jarque test statistic (Brooks 2008). According to Bera-Jarque test statistic, normally distributed data is not skewed and has a coefficient kurtosis of 3. As shown in figure 4.2, the coefficient kurtosis (3.37) of the data in this particular study was much closer to 3, and the Bera- Jarque statistic had a P-value of 0.26 implying that there was no evidence for the presence of abnormality in the data. Thus, the null hypothesis that the data is normally distributed should not be rejected since the p-value was considerably in excess of 0.05.

Figure 4.1 Normality test for residuals



Source: Eviews output

4.2.1.3 Test for multicollinearity

Multicollinearity is an implicit assumption that is made when using the OLS estimation method is that the explanatory variables are not correlated with one another Brooks, (2008). When there is multicollinearity between explanatory variables; R^2 will be high but the individual coefficients will have high standard errors, so that the regression 'looks good' as a whole, but the individual variables are not significant. This arises in the context of very closely related explanatory variables as a consequence of the difficulty in observing the individual contribution of each variable to the overall fit of the regression. Second, the regression becomes very sensitive to small changes in the specification, so that adding or removing an explanatory variable leads to large changes in the coefficient values or significances of the other variables. Finally, near multicollinearity will thus make confidence intervals for the parameters very wide, and significance tests might therefore give inappropriate conclusions Brooks (2008). According to Lewis-Beck, (1993) suggestion in order to find out the multicollinearity problem, the bi-variate correlations among the independent variables should be examined and the existence of correlation of about 0.8 or larger indicates a problem of multicollinearity.

Table 4.4 Correlation matrices of explanatory variables

	ROA	NMB	ATM	NSA	POS	NDB	MGT_E
ROA	1.000000						
NMB	0.178483	1.000000					
ATM	-0.098336	0.698768	1.000000				
NSA	0.196038	-0.011163	0.478116	1.000000			
POS	0.037779	0.668672	0.731086	0.475016	1.000000		
NDB	0.054537	0.767218	0.783706	0.287765	0.709453	1.000000	
MGT_E	-0.346845	-0.790297	-0.647102	-0.168604	-0.701924	-0.786403	1.000000

Source:

According to table 4.4 Even though, there are variables which have high correlation coefficient, the highest correlation is -0.786403 between Number of debit card holders and managerial efficiency. Since there is no correlation above 0.8 in this study according to Cooper and Schendlar (2003) and Lewis-Beck (1993), it can be concluded in this study that there is no problem of multicollinearity, thus enhanced the reliability for regression analysis.

4.3 Choosing Random effect Vs fixed effect model

The results so far indicate that all CRLM assumptions are not violated, so the ordinary least square regression can be safely applied. However, since this study uses a panel data, there are two types of panel estimator approaches that can be employed, namely: fixed effects models (FEM) and random effects models (REM) Brooks, (2008).

The simplest types of fixed effects models allow the intercept in the regression model to differ cross-sectionally but not over time, while all of the slope estimates are fixed both cross-sectionally and over time. The random effects approach proposes different intercept terms for each entity and again these intercepts are constant over time, with the relationships between the explanatory and explained variables assumed to be the same both cross-sectionally and temporally Brooks, (2008).

To examine whether individual effects are fixed or random, a Hausman specification test was conducted providing evidence in favor of the REM model Baltagi (2005). The null hypothesis for this test is that unobservable heterogeneity term is not correlated or random effect model is appropriate, with the independent variables. If the null hypothesis is rejected then we employ Fixed Effects method Brooks, (2008).

The Hausman test hypothesis is:-

H0= Random effect model is appropriate

H1= Fixed effect model is appropriate

Table 4.5 Hausman Test

Correlated Random Effects - Hausman Test

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	23.428703	6	0.0007

Source: Eviews output

Table 4.6 above shows Hausman specification test, the P-value of a model is 0.007, which is less than 5% level of significance. Hence, the null hypothesis of the random effect model is appropriate is to rejected at 5 percent of significant level. This implying that, fixed effect model is more appropriate than Random effect model and gives more comfort that random effects model results are valid.

4.4 Regression analysis results

Eviews regression output is divided into three panels. The top panel summarizes the input to the regression, the middle panel gives information about each regression coefficient, and the bottom panel provides summary statistics about the whole regression equation. The two most important numbers, “R-squared” (the one who answered how much percent of the variance in the dependent variable in the regression accounted for) and “S.E. of regression.” and the one that shows how far is the estimated standard deviation of the error term. Five other elements, “Sum squared

residuals," "Log likelihood," "Akaike info criterion," "Schwarz criterion," and "Hannan-Quinn criter." are used for making statistical comparisons between two different regressions. The next two numbers, "Mean dependent var" and "S.D. dependent var," report the sample mean and standard deviation of the left hand side variable Brooks, (2008).

"Adjusted R-squared" makes an adjustment to the plain-old to take account of the number of right hand side variables in the regression. Measures what fraction of the variation in the left hand side variable is explained by the regression. The adjusted, sometimes written, subtracts a small penalty for each additional variable added.

"F-statistic" and "Prob (F-statistic)" come as a pair and are used to test the hypothesis that none of the explanatory variables actually explain anything. Put more formally, the "F- statistic" computes the standard F-test of the joint hypothesis that all the coefficients, except the intercept, equal zero. "Prob (F-statistic)" displays the p-value corresponding to the reported F-statistic.

The final summary statistic is the "Durbin-Watson," the classic test statistic for serial correlation. A Durbin-Watson close to 2.0 is consistent with no serial correlation, while a number closer to 0 means there probably is serial correlation Brooks, (2008). Hence, as concluded in the Hausman test (Table 4.6) above the random effects model is appropriate regression analysis to this study.

4.4.1 Operational model

The operational panel regression model used to find the significant factors of financial performance of commercial banks in Ethiopia measured by Return on Asset (ROA) was:

$$\mathbf{ROA= \beta_0+\beta_1 VATM_{i,t}+\beta_2 VPOS_{i,t}+\beta_3 NDC_{i,t}+ \beta_4 NMB_{i,t}+ \beta_5 NIB_{i,t}+\varepsilon}$$

Table 4.6 Fixed effect model regression result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.066082	0.029077	2.272663	0.0355
NMB	0.740112	0.347505	2.129786	0.0472
ATM	-1.224058	0.367739	-3.328607	0.0037
NSA	0.282052	0.093975	3.001340	0.0077
POS	0.542163	0.365500	1.483346	0.1553
NDB	-0.766262	0.589150	-1.300624	0.2098
MGT_E	-0.072739	0.034233	-2.124821	0.0480
	Effects Specification			
Period fixed (dummy variables)				
R-squared	0.597469	Mean dependent var		0.032448
Adjusted R-squared	0.418566	S.D. dependent var		0.005930
S.E. of regression	0.004522	Akaike info criterion		-7.698601
Sum squared resid	0.000368	Schwarz criterion		-7.266655
Log likelihood	112.9311	Hannan-Quinn criter.		-7.570161
F-statistic	3.339633	Durbin-Watson stat		1.595423
Prob(F-statistic)	0.015990			

Source: Eviews output

ROA= 0.050099+-1.124895ATMi,t+0.410227POSi,t+0.427680NDCi,t+ 0.719201NMBi,t+ 0,285439 NSAi,t +- 0.051167MGT.E+ε

4.4.2 Interpretations on regression results

This section discusses in detail the analysis of the results for each explanatory variable and their importance in determining financial performance. Furthermore, the discussion analyzes the statistical findings of the study in relation to the previous empirical evidences. Hence, the following discussions present the interpretation on the fixed effects model regression results and relationship between explanatory variables and ROA.

As shown from the above table the R-square and Adjusted R-squared values of the model was of 0.59 and 0.41 respectively the result indicates that about 59.7 % of the variability in the dependent variable (Return on Asset) is explained by the independent variables used in the model. That is Number of mobile banking users, Number of ATM Debit Cards, Number of new saving account, Number of POS, and Management efficiency collectively explain 41.8% of the change in ROA. The remaining 58.2% of the variability in the dependent variable is left unexplained by the explanatory variables used in the study. This means that the remaining 58.2% of the changes was explained by other variables which are not included in the model.

In this study ROA was used as a main financial performance measure. The reason for using ROA as the measurement of bank performance was because the ROA reflects the ability of a bank's management to generate profits from the bank's assets and also indicates how effectively the bank's assets are managed to generate revenues. Moreover, performance is best measured by ROA (Tan et al., 2012). The regression analysis result is presented by using separate table for each model. Table 4.6 shows the regression analysis for ROA. In this regression analysis the dependent variable is ROA while the independent variable is Number of mobile banking users, Number of ATM Debit Cards, Number of new saving account, Number of POS, and Management efficiency.

Furthermore, the F-statistic was 3.339633 and the probability of not rejecting the null hypothesis that there is no statistically significant relationship existing between the dependent variable (ROA) and the independent variables, is 0.015990 indicates that the overall model is significant at 5% and that all the independent variables are jointly significant in causing variation in return on asset.

The panel fixed effect estimation regression result in the above table 4.6 shows that, coefficient intercept (α) is 0.066082. This means, when all explanatory variables took a value of zero, the average value ROA would be take 0.066082 unit and statistically significant at 5% level of significance.

4.4.2.1 Mobile Banking and Financial performance

Hypothesis testing of the relationship between Mobile banking and financial performance of commercial banks in Ethiopia:

Hypothesis 1: Mobile Banking has positive and significant effect on profitability of commercial banks in Ethiopia.

Conclusion: Failed to reject the formulated hypothesis since the regression coefficient show on table 4.6 of Number of mobile banking users is 0.740112 and its P- value is 0.0472. It indicate that where other explanatory variables remain constant number of mobile banking users have a positive influence on ROA and implies that when number of mobile banking users increase by 1% then the ROA will increase by 74% and statistically significant at 5%. This means commercial banks with high number of mobile banking users are more profitable than commercial banks with low number of mobile banking users.

This result is consistence with many studies which have undertaken with different countries; in the studies which undertake in Kenya by Misati et al (2010), it is revealed that mobile banking had expanded the range of services that a bank could offer and hence expanded incomes for banks. Similar findings were shown in a study conducted on Uganda by Porteus (2006) and another one in Tunisia by Mabrouk and Mamogholi (2010) who concluded that mobile banking helped to increase bank incomes and profitability. Gichugu & oloko (2015) also concluded that mobile phone banking positively influenced the financial performance of commercial banks in Kenya. However, in the study by Sujud and Hashim (2017) concluded that mobile banking do not have any significant impact on the return on assets (ROA) of Lebanese commercial banks which is contradict to this finding.

The major reasons for these are: first, mobile banking provides an alternative service delivery channel for banks which is both accessible and affordable to many customers, this increase the satisfaction of customer which can increase the potential customers for the banks. Second since, transaction made by mobile banking in Ethiopia are transfer of balance from one account to another account, payment to beneficiary in there bank account and look in to activity summary. Therefore, these transactions do not have effect on the total deposit the bank. Finally, in mobile Banking the customers can easily access their account at any time without going to the bank physically this can reduce transaction cost including time and money incurred by both the commercial bank and customer.

4.4.2.2 Automated Teller Machine and Financial performance

Hypothesis testing of the relationship between ATM and financial performance of commercial banks in Ethiopia:

Hypothesis 2: ATM has positive and significant effect on profitability of commercial banks in Ethiopia.

Conclusion: Reject the formulated hypotheses since there is a negative and significant relationship between ATM and financial performance of commercial banks in Ethiopia. The E-views results of the effects of ATMs on the profitability of commercial banks also indicated in table 4.6 According to the result showed that other explanatory variables remains constant number of ATMs terminals have a negative influence on banks' profitability and statistically significant. The regression coefficient is -1.224058 and its P- value is 0.0037. This mean as the number of ATM terminals increase by 1% profitability would decrease and statically significant at 1%.

The result findings of this research agree with the result of Valahzaghrd and Bilandi (2014) study conducted in Iran banks during the period 2007-2012. Based on the results of their study they concluded that ATM and POS may not have any meaningful impact on profitability. It is also consistence with study conducted in Ethiopia by Tilahin (2016) which conclude that ATM has negative and significant relationship with financial performance of commercial banks in Ethiopia in 2013-2015.

In contrast to the results of this research study the results of the following research findings on the impact of ATMs in the profitability of banking in different countries. For instance, Nader (2011) in a study conducted among Saudi Arabia banks during the period 1998-2007 where the results of the study confirmed that availability of ATMs and branches had a positive effect of profit efficiency of Saudi banks. Similar with Nader (2011) the study result by Agboola (2006) conducted in Nigeria showed that the increase in the adoption of ATMs had a positive impact on a bank's image and its profitability. In the same token, the study of Hasan et.al.(2009) conducted across the European Union which showed that ATMs increased bank profitability in terms of accounting ratios and cost efficiency. Likewise, the study of Gakure & Ngumi (2013) stated that ATMs contributed positively to the profits of commercial banks in Kenya.

The negative association between ATM and financial performance of commercial banks could be attributed to the fact that, ATMs are not capable of generating enough profit for commercial banks irrespective of their cost of installation and customers solely withdraw the money which can affect the bank total asset. However, Ethiopian commercial banks are installing more ATM terminals

across the country and use core banking to their ATM terminals in order to increase their convenience to their customers. This happened because it can increases customer satisfaction by accessing their account 7/24 and attract more customer.

4.4.2.3 New saving Account and Financial Performance

Hypothesis testing of the relationship between New saving Account and financial performance of commercial banks in Ethiopia:

Hypothesis 3: New Saving Account has positive and significant effect on profitability of - commercial banks in Ethiopia.

Conclusion: Failed to reject the formulated hypothesis since there is a positive and significant relationship between New saving Account and financial performance of commercial banks in Ethiopia. A new saving account has a positive and significance effect in financial performance of commercial banks in Ethiopia. From fixed regression result presented in table 4.6 shows that the coefficient Number of new saving account is 0.282052 and the P- value is 0.0077. Holding other independent variables constant at their average value, when Number of new saving account increased by one percent, return on asset (ROA) would be increase by 28 percent and statistically significant at 1% level of significant.

This result is in line with the study entitled product innovation and financial performance of SACCO in Kirinaya countries Kenya by Ngure et al (2017) concluded that introduction of new products lead to better financial performance. In particular, if a SACCO introduces new deposit accounts, the amount of deposits will increase thus increasing the financial performance. Peter Tufano & Daniel Schendier (2009) in their literature using financial innovation to support saver stated that prize linked investment products manipulate psychological incentives to increase saving. Zewdie (2013) a research carried out in Kenya concluded that number of minor/children account, number of special deposit account and number youth oriented account has positive and significant effect on performance of banks.

When commercial banks come up with different savings accounts which are flexible and customer friendly and such accounts includes children account which encourage parents to open saving accounts for their children for long term benefits; hybrid accounts, women's savings account to encourage and support women's, student account, salary account, pension account and others this will reduce the number of unbanked population (Fortune, 2013) and also it can mobilize the deposit of commercial banks in Ethiopia. And deposits are an indispensable tool commercial banks use to enhance its profitability of commercial banks.

4.4.2.4 Point of Sales terminals and financial performance

Hypothesis testing of the relationship between POS and financial performance of commercial banks in Ethiopia:

Hypothesis 4: POS has significant has positive and significant effect on profitability of commercial banks in Ethiopia.

Conclusion: Reject the formulated hypothesis. Even though there is a positive relationship with ROA, the relationship becomes insignificant. According to table 4.6 showed the influence of number of POS terminals on ROA is positive but not statistically significant. The result envisages that when other explanatory variables remain constant as the number of POS increase in one % profitability would increase by 54% and it's statistically insignificant.

The result findings of this research agree with the result of Valahzaghrd and Bilandi (2014) study conducted in Iran banks during the period 2007-2012. Based on the results of their study they concluded that ATM and POS may not have any meaningful impact on profitability. The findings are further supported by sujud and Hashem (2017) that conclude POS, internet banking and mobile banking need large primary investment expenses and therefore, they initially have low-income margins and thus lesser contribution to return on assets (ROA).

The positive association between POS and financial performance of commercial banks could be attributed to the fact that, POS terminals have provided an opportunity for commercial banks to establish agent banking in non-traditional bank locations. In addition it helps to improve their profitability of banks through income generated in the form of charge fee and by reduction of banks operational costs. And also it can increase customer satisfaction because it allows customers to purchase, pay bills and access statements without going to bank. However, POS terminals are a recent phenomenon in Ethiopia banking industry, many commercial banks have introduce this innovational product very soon and the distribution of POS terminals is also restricted to the major cities of the countries and can't cover the rural areas. This could be the major reason that the relation between POS terminals and return on Asset (ROA) is not statically significant.

4.4.2.5 Debit Card and Financial performance

Hypothesis testing of the relationship between Debit Card and financial performance of commercial banks in Ethiopia:

Hypothesis 5: Debit card has significant has positive and significant effect on profitability of commercial banks in Ethiopia.

Conclusion: Reject the formulated hypothesis. As table 4.6 showed the effect of debit cards on ROA is negative. The number of debit card holders has a negative and also insignificant effect on return on asset (ROA). The result envisaged that when other explanatory variables remains constant as the number of Debit cards holders increase by 1% ROA would decrease by 76 % and also statistically insignificant.

The findings of this study on ROA is consistent with previous research undertaken in Ethiopia by Solomon worku (2016) and contradict with those of Akhisar et al (2015) conducted in 23 developing and developed countries where the study concluded that cards (debit and credit) and ATM improved profitability of a bank which is measured by both return on assets (ROA) and Return on equity (ROE). Likewise, Sujud & Hashem (2017) concluded that debit and credit cards have a significant impact on the return on assets of Lebanese commercial banks

The possible reasons for the negative relationship between Debit card and financial performance of commercial banks in Ethiopia are inactive cards hold by customers due to Lack of awareness, cost of producing card.

4.4.2.5 Management efficiency and financial performance

Hypothesis testing of the relationship between Management efficiency and financial performance of commercial banks in Ethiopia:

Hypothesis 6: Managerial Efficiency has negative and significant effect on profitability of commercial banks in Ethiopia.

Conclusion: Failed to reject the formulated hypothesis since there is a negative and significant relationship between Managerial efficiency and financial performance of commercial banks in Ethiopia. According to Table 4.6 also the finding of the study revealed that managerial efficiency has negative relationship with profitability variables (ROA) and also statically significant at 5%. This means as operating cost to total income ratio increase by one profitability decrease by 0.067. The negative relation of this variable with profitability indicate that in a bank where there is a management quality is low, there inefficiency in expense management which increase the operating cost of the bank which in turn decrease the profitability of the bank. On the other hand, where management quality is low and managerial monitoring is imperfect. Finally the total sum effect will reduce profitability.

The result is consistence with Rao and Lakew (2012), Tesfaye (2013) and Mohanty (2017) which are concluded that operational (Managerial) efficiency has a negative effect on profitability of commercial banks in Ethiopia.

Chapter five: Conclusion and Recommendation

5.1 Summary of findings

The study was conducted with an aim of examining the effects of financial innovations on financial performance of commercial banks. The financial performance as the dependent variable was measured by ROA for the period 2015 to 2017. The financial innovativeness aspect is measured by five factors (Number of mobile banking users, Number of New saving accounts, Number of ATM, Number of POS and Number of debit cardholders) and managerial efficiency was used as a control variable. Descriptive statics of the dependent and independent variables for nine commercial banks from the year 2015 to 2017 was analyzed. Multiple regression analysis with OLS estimator and fixed effect estimates was also conducted to evaluate the linear relationship between the dependent and the independent variables. To maintain the data validity and robustness of the regressed result of the research, the most critical regression diagnostic tests consisting of Normality, Multicollinearity, Heteroscedasticity and Autocorrelation and Model specification are tested.

Descriptive statics shows that during 2015 to 2017 the average profit level; ROA of Ethiopian banks are 3.24 percent. And the volatility of ROA of commercial banks in Ethiopia varies from the mean by 0.59% as indicated in Table 4.1. The average Managerial efficiency level is 38.7%. And the volatility of Managerial efficiency level of commercial banks in Ethiopia varies from the mean by 5.8% as indicated in Table 4.1.

The popular white test was conducted to test the presence of heteroscedasticity and all the F-, Scaled explained SS and $\chi 2$ ('LM') versions of the test statistic give the same conclusion that there is no evidence for the presence of heteroscedasticity, since the p-values are considerably in excess of 0.05. According to table 4.6, the Durbin-Watson test statistic of this study (1.59) was clearly between the upper limit (1.974) and the lower limit (0.925) and it lies on inconclusive region. Therefore, Breusch–Godfrey serial correlation LM test was conducted and F test result and the P value of F-statistic 0.1602 which were beyond the significance level of 5%. Hence, there is no for autocorrelation. Bera- Jarque test was used to check normality and gives P-value of 0.26 implying that there was no evidence for the presence of abnormality in the data. Correlation matrices of explanatory variables shows there is no the problem of multicollinearity since no correlation between variables shows more than 80%. the P-value of Hausman specification test, shows 0.007, which is less than 5% level of significance which implying that, fixed effect model is more

appropriate for this model therefore the regression is conducted on fixed effect model.

Study results indicated that the independent variables (Number of mobile banking users, Number of New saving accounts, Number of ATM, Number of POS, Number of debit cardholders and managerial efficiency) explain and can therefore predict financial performance of commercial banks. These variables could explain 59.7% of the variation in profits in the banking sector (r-squared = 0.597). The rest 40.3% of variation in profitability in the banking sector is not explained by this model. The p- value of F statics is 0.015990 indicates that the overall model is significant at 5% and that all the independent variables are jointly significant in causing variation in return on asset.

The panel fixed effect estimation regression result in table 4.6 shows that; coefficient intercept (α) is 0.066082. This means, when all explanatory variables took a value of zero, the average value ROA would be take 0.066082 unit and statistically significant at 5% level of significance.

The finding of the regression result in table 4.6 shows mobile banking is positively and significantly affects ROA. The coefficient of number of mobile banking users is 0.740112 and its P- value is 0.0472 which indicate that where other explanatory variables remain constant number of mobile banking users have a positive influence on ROA and implies that when number of mobile banking users increase by 1% then the ROA will increase by 74% and statistically significant at 5%.

ATM has negative and significant relationship for ROA since the regression coefficient is -1.224058 and its P- value is 0.0037. This mean as the number of ATM terminals increase by 1% profitability would decrease by 122% and statically significant at 1%. This is due to very high initial investment as compared to the profit collected.

New saving accounts have positive and significant relationship with ROA. According to table 4.6 the coefficient of Number of new saving account is 0.282052 and the P- value is 0.0077. which means the introduction of new saving account by 1% increased commercial banks profit (ROA) by 28 percent.

Point of sale terminals and Debit card are in significant for ROA of commercial banks in Ethiopia. The influence of POS terminals on ROA is positive but not statistically significant. Table 4.6 shows as the number of POS increase in one % profitability would increase by 54% and it's statistically insignificant. As table 4.7 showed the effect of debit cards on ROA is negative but statically insignificant. The result envisaged that when other explanatory variables remains constant as the number of Debit cards holders increase by 1% ROA would decrease by 76 % and

also statistically insignificant. This is due to a number if inactive card by customer due to lack of knowledge and the cost of issuing cards.

5.2 Conclusion

The study conducted to examine the effect of financial innovation and financial performance of commercial banks in Ethiopia. The researcher therefore based on the findings presented in the above section makes conclusions regarding the effects of financial innovations and financial performance of commercial banks.

In general, financial innovation (both product and institutional innovation) influence financial performance of commercial banks in Ethiopia positively. It has significant effect on profitability and also influences their competitive advantage. Some of insignificant and negative impact of variables is due to a low level of adoption of financial innovation in Ethiopia commercial banking sector. This is in agreement with the argument of Tilahun (2016) and Solomon (2016) which are conducted in Ethiopia to examine the effect of E-banking on financial performance of commercial banks in period of covering 2013-2015. These in their findings indicate that E-banking have positive impact on financial performance of commercial banks in Ethiopia.

5.3 Recommendation

Firstly, banks should engage in financial innovation whether it is technological or technical in order to boost their profitability. The world is gradually changing and it needs to move with the world as it becomes a global village and this can help them achieve their aim of shareholder satisfaction and also meeting the customer needs.

From the findings, the study established that mobile banking as a financial innovation positively impacted on the financial performance of commercial banks in Ethiopia over the 3 year period. Therefore, commercial banks must do great in creating awareness on the advantage of mobile banking than traditional banking system in order to boost the banks financial performance and increase customer satisfaction. Other banks which are not introduced mobile banking are recommended to implement it.

Since new saving account affects financial performance of commercial banks in Ethiopia positively. Commercial banks are recommended to keep up on introducing & creating new customer friendly saving account type which can encourage customers to save. And this can also positively affect the saving culture of the community.

Even though, ATM has a negative impact on ROA of commercial banks in Ethiopia. Banks must not give up on showcasing their ATM network across the country. Because it can increase their convenience to their customer which increase the number of customer and eventually increase their profitability in the long run.

Commercial banks in Ethiopia must do great in creating awareness on the advantage of using banking service though financial innovations for both urban and rural areas. In addition they must increase the accessibility of POS terminals and encourage customers to convert cash base transaction in to digitalized transaction way. By creating this culture of using financial innovative product commercial banks can get the expected profit by reducing transaction cost and paper work in banks.

Finally, the researcher suggests other researchers to study on this area since financial innovation in Ethiopia is lowly studied and the area is very dynamic. Hence, other researchers are suggested to include other unstudied variables like Agency banking, Internet banking and Electronic Fund transfer on their study.

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Appendix A: Heteroscedasticity Test: White

Heteroskedasticity Test: White

F-statistic	1.800988	Prob. F(6,20)	0.1500
Obs*R-squared	9.470905	Prob. Chi-Square(6)	0.1488
Scaled explained SS	6.504981	Prob. Chi-Square(6)	0.3691

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 05/29/18 Time: 10:05

Sample: 1 27

Included observations: 27

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.94E-05	6.05E-05	0.651701	0.5220
NMB^2	0.016428	0.022835	0.719438	0.4802
ATM^2	-0.087761	0.035507	-2.471662	0.0226
NSA^2	0.008482	0.005870	1.444953	0.1640
POS^2	0.023150	0.028529	0.811443	0.4267
NDB^2	0.019790	0.037773	0.523916	0.6061
MGT_E^2	-0.000188	0.000193	-0.970367	0.3435

R-squared	0.350774	Mean dependent var	1.45E-05
Adjusted R-squared	0.156007	S.D. dependent var	2.34E-05
S.E. of regression	2.15E-05	Akaike info criterion	-18.44133
Sum squared resid	9.22E-09	Schwarz criterion	-18.10537
Log likelihood	255.9580	Hannan-Quinn criter.	-18.34143
F-statistic	1.800988	Durbin-Watson stat	1.493828
Prob(F-statistic)	0.149995		

Appendix B: Fixed effect test result

Dependent Variable: ROA

Method: Panel Least Squares

Date: 05/29/18 Time: 09:58

Sample: 2015 2017

Periods included: 3

Cross-sections included: 9

Total panel (balanced) observations: 27

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.066082	0.029077	2.272663	0.0355
NMB	0.740112	0.347505	2.129786	0.0472
ATM	-1.224058	0.367739	-3.328607	0.0037
NSA	0.282052	0.093975	3.001340	0.0077
POS	0.542163	0.365500	1.483346	0.1553
NDB	-0.766262	0.589150	-1.300624	0.2098
MGT_E	-0.072739	0.034233	-2.124821	0.0480

Effects Specification

Period fixed (dummy variables)

R-squared	0.597469	Mean dependent var	0.032448
Adjusted R-squared	0.418566	S.D. dependent var	0.005930
S.E. of regression	0.004522	Akaike info criterion	-7.698601
Sum squared resid	0.000368	Schwarz criterion	-7.266655
Log likelihood	112.9311	Hannan-Quinn criter.	-7.570161
F-statistic	3.339633	Durbin-Watson stat	1.595423
Prob(F-statistic)	0.015990		

Appendix C: Correlated Random Effects - Hausman Test

Correlated Random Effects - Hausman Test

Equation: Untitled

Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	23.428703	6	0.0007

** WARNING: estimated cross-section random effects variance is zero.

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
NMB	0.770574	0.719201	0.047553	0.8138
ATM	0.573647	-1.124895	0.299436	0.0019
NSA	0.211773	0.285439	0.014838	0.5453
POS	0.282132	0.410227	0.124033	0.7161
NDB	-2.137575	-0.427680	1.220056	0.1216
MGT_E	-0.045610	-0.051167	0.000593	0.8195

Cross-section random effects test equation:

Dependent Variable: ROA

Method: Panel Least Squares

Date: 05/29/18 Time: 10:00

Sample: 2015 2017

Periods included: 3

Cross-sections included: 9

Total panel (balanced) observations: 27

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.062418	0.024491	2.548613	0.0255
NMB	0.770574	0.331500	2.324504	0.0385
ATM	0.573647	0.604774	0.948530	0.3616
NSA	0.211773	0.139248	1.520833	0.1542
POS	0.282132	0.430741	0.654992	0.5248
NDB	-2.137575	1.161512	-1.840338	0.0906
MGT_E	-0.045610	0.032392	-1.408061	0.1845

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.859425	Mean dependent var	0.032448
Adjusted R-squared	0.695421	S.D. dependent var	0.005930
S.E. of regression	0.003273	Akaike info criterion	-8.306189
Sum squared resid	0.000129	Schwarz criterion	-7.586280
Log likelihood	127.1336	Hannan-Quinn criter.	-8.092122
F-statistic	5.240275	Durbin-Watson stat	1.927244
Prob(F-statistic)	0.003320		

Appendix D: Ramsey RESET Test

Ramsey RESET Test

Equation: UNTITLED

Specification: ROA C NMB ATM NSA POS NDB MGT_E

Omitted Variables: Squares of fitted values

	Value	df	Probability
t-statistic	0.437135	19	0.6669
F-statistic	0.191087	(1, 19)	0.6669
Likelihood ratio	0.270189	1	0.6032

F-test summary:

	Sum of Sq.	df	Mean Squares
Test SSR	3.90E-06	1	3.90E-06
Restricted SSR	0.000391	20	1.96E-05
Unrestricted SSR	0.000387	19	2.04E-05
Unrestricted SSR	0.000387	19	2.04E-05

LR test summary:

	Value	df
Restricted LogL	112.1020	20
Unrestricted LogL	112.2371	19

Unrestricted Test Equation:

Dependent Variable: ROA

Method: Least Squares

Date: 05/29/18 Time: 10:02

Sample: 1 27

Included observations: 27

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.097236	0.110646	0.878805	0.3905
NMB	1.798695	2.493388	0.721386	0.4795
ATM	-2.747927	3.729846	-0.736740	0.4703
NSA	0.688108	0.925846	0.743221	0.4664
POS	0.977603	1.342294	0.728308	0.4753
NDB	-1.012985	1.427763	-0.709491	0.4866
MGT_E	-0.123958	0.169105	-0.733023	0.4725
FITTED^2	-21.95078	50.21505	-0.437135	0.6669

R-squared	0.576233	Mean dependent var	0.032448
Adjusted R-squared	0.420109	S.D. dependent var	0.005930
S.E. of regression	0.004516	Akaike info criterion	-7.721264
Sum squared resid	0.000387	Schwarz criterion	-7.337312
Log likelihood	112.2371	Hannan-Quinn criter.	-7.607095
F-statistic	3.690857	Durbin-Watson stat	1.512906
Prob(F-statistic)	0.010966		

Appendix E: List of commercial banks in Ethiopia

No	Bank Name	Established year
1.	Abay Bank S.C.	2010
2.	Addis International Bank S.C	2011
3.	Awash International Bank	1994
4.	Bank of Abyssinia S.C	1996
5.	Berhan International Bank S.C	2010
6.	Bunna International Bank S.C	2009
7.	Commercial Bank of Ethiopia S.C	1963
8.	Cooperative Bank of Oromia S.C	2005
9.	Dashen Bank S.C	2003
10.	Debub Global Bank S.C	2012
11.	Enat Bank S.C	2013
12.	Lion International Bank S.C	2006
13.	Nib International Bank S.C	1999
14.	Oromia International Bank S.C	2008
15.	United Bank S.C	1998
16.	Wegagen Bank S.C	1997
17.	Zemen Bank S.C	2009

Source: https://en.wikipedia.org/wiki/List_of_banks_in_Ethiopia Accessed in May 20,2018