



INVESTMENT ON INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) AND ITS IMPACT ON FIRM PERFORMANCE: EVIDENCE FROM SELECTED BANKS

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ABSTRACT

In today's complex business environment, there are six key assets in an organization namely, human, financial, physical, intellectual, IT, and relationships, Information Technology contribute to the success of the organization in different ways, over the years various studies have been made to understand the relationship between technological investments and the performance of commercial banks and contradicting results were observed among researches. The purpose this study is to evaluate capital investment decisions on information technology and its impact on the performance of private commercial banks in Ethiopia. In order to achieve this objective mixed research approach with qualitative and quantitative methods is used on panel data of 6 private commercial banks for period of ten years starting from 2005 to 2014. The relation between dependent and independent variables is analyzed using multiple regression model by taking banks profitability measure ROA as dependent variable and IT capital, labor, capitalization, market concentration, and inflation as independent variables using OLS random effect model on Eviews8. From the study result, except for IT capital the rest of explanatory variables show statistically significant impact on the ROA. The main variable shows there is positive relation between banks IT investment and profitability but the degree of impact measured as statistically insignificant. It is also observed that private commercial banks in Ethiopia has low experience of evaluating information technology investments before and after investment is made. In general the research concluded that banks

will have better future with more technological advancements, if they are able to make sound information technology related investments with good management and IT governance system.

Key words: *IT investments, Return on Assets, Return on Investment, Organizational performance, and nonfinancial performance measures*

Background of the Study

In today's complex business environment, there are six key assets in an organization namely, human, financial, physical, intellectual, IT, and relationships (Weill and Ross 2004). Among these assets IT investment is an important element in firms' value creation process and has grown to be the largest category of capital expenditures in businesses. It is also playing important role on creating competitive advantage for businesses within the industry they are operating in. Organizations view investments in IT as a way to combat competition by improving productivity, profitability, and quality of operations (Devaraj and Kohli, 2003). Since they can obtain such benefit from investment made on IT, organizations are willing to invest enormous amount of capital on this asset. Firms all over the world have been making considerable investment on information and communication technologies aiming to increase the efficiency of both their internal processes and their transactions with customers, suppliers and business partners (OECD, 2008). In response to or anticipation of changes in their environment, most organizations are deploying information technology at an increasing rate for reasons of survival and to have competitive advantage. Due to a pervasive and steadily growth of information and communication technology, world's banking industry is entering into new phenomena of unprecedented form of competition supported by modern information and communication infrastructure. Now a day's commercial banks and information technology products are two sides of a coin which cannot be separated. In order to deliver quality customer service and to stay competitive in the market, banks have to adopt information technology products and upgrade their service quality. Information technology investments in banks are any IT related investments made to enhance better customer service; such as core banking software, Electron banking like POSs, ATMS, mobile banking, internet banking and also any software and hardware used on daily activists of the bank.

Even though the banking system in Ethiopia is still highly dependent on cash transactions, in order to customize the benefits of IT, Ethiopian financial institutions especially commercial

banks are determined to upgrade themselves with major technological advancements. As a result most commercial banks are using E-banking products to deliver service and are encouraging their customers to be part of these advancements. Unlike that of other investments, IT investments are difficult to relate and measure with organization performance. Measuring the benefits out of cost¹² is difficult because due to the fact that benefits from information technology is dynamic and most of the time intangible. As a result most organizations choose to ignore to measure the returns of information technology investment. Organization investment decision on information technology is one of the most critical and enormous amount of fund requiring investment. Most organization currently depending on information technology to be competitive on ever increasing sophisticated world.

The return on Investment and the use of Information Technology (IT) starting from the beginning has been targeted for evaluation. Statement from R. Solow (1987) asserts that IT investments were not giving a return to its investors. Other studies also prove that there exists “productivity paradox” meaning poor relationship between IT and its contribution to organization performance improvement (Dos Santos et al. 1993, Strassman 1990). However, latter studies indicated that there is a positive relationship between IT investment and organizations performance (Brynjolfsson 1993, Brynjolfsson & Hitt 1996, 1998 & 2003). Despite the great importance of IT within the organization, difficulty of measuring return of the large amount of capital invested and evaluating its impact on firm’s value inspired the researcher to investigate the area and find some gaps faced by most commercial banks in Ethiopia.

Objective of the Study

The general objective of the study is to evaluate the impact of Information Technology investments on the performance of Ethiopian Financial Institutions specifically private commercial banks. With a view to achieve the above general objective, the study has the following specific objectives:

1. To evaluate whether the decision to invest on IT was made by evaluating the pros and cons of the investment through the formal investment appraisal tools.
2. To determine to what extent has IT dominating the Ethiopian banking industry and what factors the investment decisions.

3. To understand how and to what extent the application of IT within firms leads to improved banks performance.
4. To assess the possible challenges faced by Banks while investing on information technology.

Research Question

The study attempts to answer the following research questions:

1. How do private commercial banks in Ethiopia make capital investment decision on information technology?
2. To what extent IT has been dominating the Ethiopian banking industry and what factors determine for investment decisions?
3. How and to what extent does the application of IT within firms lead to improve organizational performance?
4. What are the possible challenges faced by organizations while investing on information technology?

Review of literature:

Capital Investment on IT

Michael Gutmann (2001) define information technology (abbreviation IT) as science and activity of storing and sending out information by using computers. It is related to all aspects of managing and processing information, especially within a large organization or company. On the other hand Information technology, defined by Rodney L. Stump, (1996) includes computer hardware, software, and communications systems, as well as the personnel and resources dedicated to supporting these capabilities. Such investments are made to facilitate information management, that is, the compilation, analysis, and dissemination of task-related information. Capital investment made on information technology resources can be classified as: tangible resources that comprising the physical IT infrastructure components, human IT resources that comprising the technical and managerial IT skills, and intangible IT resources, such as knowledge assets, customer orientation and synergy (C.Zehir, B.Muceldili, B.Akyuz and Ali Celep 2010).

Capital investment decision is the most important decision management faced on every organization to shape the future of the business and its ability to manage its future operations. They are generally difficult and expensive to reverse. So they need to be right first time. In making capital investment decisions, managers aim to maximize shareholder wealth by maximizing long- term returns, taking account of risk and liquidity. Firms investment decision on information technology is one of the most critical and enormous amount of fund requiring investment. Most organization currently depending on information technology to be competitive on ever increasing sophisticated world. Eyob Dagne (2010) defined IT capital investment as any acquisition of computer hardware, network facilities, or pre-developed software, or any “in-house” systems development project, that is expected to add to or enhance an organization’s information systems capabilities and produce benefits beyond the short term. Various studies demonstrates that many firms are in fact becoming dependent on IT, however investing in IT can be an extremely expensive and time-consuming process and its justification is difficult to quantify because of ineffective Information Management Systems (IS).

Investment on information technology is known as the most challenging investment decision for mangers; due to the difficulty of measuring its return. For some organizations IT investment requires basic structural change within the organization; which is most of the time becoming reason for failure of IT investment. Brynjolfsson (2003) and Karl Westerlind (2004) show that when investments of this sort are supplemented with restructuring in the organization, the return occur faster. Decisions making on capital investment on information technology is process of three major inter depending phases staring from selecting the appropriate investment to its implementation, management and control. Select phase which is the first phase organizations identifies and analyzes each project’s risks and returns before committing significant funds to any project and selects those IT projects that will best support its mission needs. This process should be repeated each time funds are allocated to projects, reselecting even ongoing investments has to pass on this phase. The second phase is control phase on which the organizations ensures that, as projects develop and investment expenditures continue, the project continues to meet mission needs at the expected levels of cost and risk. If the project is not meeting expectations or if problems have arisen, steps are quickly taken to address the deficiencies. If mission needs have changed, the organization is able to adjust its objectives for the project and appropriately modify expected project outcomes. The third phase is known as

evaluate phase, actual versus expected results are compared after a project has been fully implemented.

Investment on IT and Organization Performance

“Productivity paradox” refers to an investment on information technology in the 1980s, on which most studies point out the relation between information technology and organizational performance was negative that information technology has no significant effect on organizations, industries and economy as whole (Robert Solow, 1987). There are some reasons why the productivity paradox exists. The main reason is likely to be due to Measurement errors of IT capital (Brynjolfsson, 1993). This can be due to rapid price and quality changes, and failure of economic statistics to measure qualitative improvements in the output of service industries. Since most studies were made in the United States and lots of technological advancements have been witnessed since then, the 1980s productivity paradox face time and space gap in order to use them on current information technology investments.

Information technology (IT) can be accepted as a unique resource in a firm in the ends of the 20th century and 21th century (Cemal et al, 2010). Investment on information technology is most of the time assumed to add value to the organization even though measuring the ultimate benefit and return is difficult. But in general anticipated benefits from technology investments include reduced costs, improved quality, increased flexibility, improved customer satisfaction, higher productivity and ultimately, higher financial performance and coordination (Cemal et al 2010; Karl Westerlind 2004 ; Eyob Dagne 2010; Lu Zhang & Jinghua Huang 2009 and Shirley J. Ho & Sushanta K. Mallick 2006). According to much theoretical and empirical evidence, IT offers benefits for a wide range of business processes and improves information and knowledge management within the firm, leading to better performance. Firms can manage their processes more efficiently and, as a consequence, they increase their operational efficiency.

Business value of information technology is dependent on many external and internal factors. IT is an input in the production process and there is an interaction between IT and other inputs. Recently, the empirical literature has begun to re-assess the association between IT and a wide variety of complementary factors (Arvanitis and Loukis, 2009; Giuri, 2008 and Aral & Weill 2007), with a consensus emerging that, in order for IT to be properly utilized, it must be used in conjunction with complementary resources such as organizational structure, human resources or organizational resources (Ana Gargallo-Castel and Carmen Galve-GórrizWalton,

1989; Bélanger and Collins, 1998; Bresnahan et al., 2002; Mata et al., 1995; Ramírez et al., 2001; Peppard and Ward, 2004; Aral et al., 2010).

Managing IT Investment

IT Management is managerial skills for the acquisition, management, and use of IT in key business processes and strategies and include IT infrastructure capability, IS-business partnering, solutions delivery, vendor partnering, and strategic planning as key IT capabilities (Sunil, Narayan, M. S. Krishnan and V. Sambamurthy, 2003 p3-4). Because of large amount of capital investment, over all IT practice in an organization has to have strong management and IT governance structure so that the appropriate benefit from IT can be fully utilized. To strengthen this doubt, Senft and Gallegos (2009) argue that as high-speed information processing has become indispensable to organizations' activities, from a worldwide perspective, IT processes need to be controlled and from a historical standpoint, much has been published about the need to develop skills in the field of IT audit and control. This is because when information systems or technology fail, they often cause significant impacts on shareholder value (Parent and Reich, 2009).

Mullineux (2006) also claimed that banks are special because their managers have duty to (more risk averse) depositors as well as (more risk prone) shareholders and thus a solution to the "principal-agent problem" aimed at maximizing shareholder value is inappropriate. Gruttner (2010) claimed that more than a way to create competitive advantage, IT plays a fundamental role in the banking market and IT Governance provides tools to manage IT structures and processes in order to appropriately support the business strategy. Implementing new IT Governance in financial institutions may be very challenging, especially when technical literature has not many examples in developing markets. Hence, the overall governance of banks and their IT governance in particular would be of critical interest for academia as well as practitioners.

IT Investment in Commercial Banks

Recently, the world has witnessed a great development and a rapid change in the global banking environment as the circumstances obligated the banking industry to reconsider its structure, laying down strategies and the means used to achieve them in a world where the concepts became different and diversified and the competition turned out to be the foundation on both the domestic and international area. (K.A. Saeed and R Bampton, 2013). Information technology

has become the heart of banking sector while banking industry is the heart of every economy (Alhaji A.A and Rosmaini HJ, 2012). The recent economic crisis in the world raised from banking industry can be seen as proof for the influence of the industry on the world. Technology is now a day's becoming key element to overcome challenges in modern banking business such as performance improvement, customer's satisfaction and quality of service delivered. Through the introduction of IT related products in internet banking, electronic payments, security investments, information exchanges (Berger, 2003) banks now can provide more diverse services to customers with less manpower. Seeing this pattern of growth, it seems obvious that IT can bring about equivalent contribution to profits. In response to the demands for quick, efficient and reliable services, industry players are increasingly deploying technology as a means of generating insights into customers' behavioral patterns and preferences. Well-developed outsourcing support functions (technology and operations) are increasingly being used to provide services and manage costs (e.g. Automated Teller Machine networks, Cards processing, Bill presentment and Payments, Software Development, Call center operations and Network management). (Oluwagbemi O et al, June 2011).

Technology investments in banks have two dimensions first one is technological investments which are directly related to customers. Using the techniques of electronic banking such as home banking services via the internet, which exceeds the dimensions of space and time, automated teller machines (ATMs) where customers can easily access their account from any geographic location, point of sale (POS) machines which avoids unnecessary cash on hand while shopping in trade centers, Mobile Banking and etc. Such IT investments provide banking services that achieve advantages for both banks and customers in the provision of banking products and services (K.A. Saeed & R.Bampton 2013) and the second information technology investments in banks is investment made on various software's and applications that banks use for internal work such software used in payroll processing, financial and other report preparation, stock management, purchasing and others. Both kinds of investments enable banks to improve their performances. It is believed that IT can improve bank's performance in two ways: according to K.A. Saeed and R Bampton, (2013) IT can reduce operational cost (cost effect), and facilitate transactions among customers within the same network (network effect). In the prior decades IT capital investment is more intensive in financial sectors, specifically in

banks. According to Heike Mai (2012), In America, Europe and Asia financial services firms spend more on IT than other industries.

Performance Measurement of Commercial Banks

Adequate performance of financial institutions is of crucial importance to their customers. Prices and quality of their products are determined by efficiency and competition. Since efficiency and competition cannot be observed directly, various indirect measures in the form of simple indicators or complex models have been devised and used both in theory and in practice (Jacob A. Bikker, 2010, p -1). By bank performance, generally, it implies whether a bank has performed well within a trading period to realize its objectives. According to Rose (2001), a fair evaluation of any bank's performance should start by evaluating whether it has been able to achieve the objectives set by management and stockholders. Certainly, many banks have their own unique objectives. Some wish to grow faster and achieve some long-range growth objective, others seem to prefer quiet life, minimizing risk and conveying the image of a sound bank, but with modest rewards to their shareholders (Rose, 2001). Ordinarily, stock prices and its behavior are deemed to reflect the performance of a firm. This is a market indicator and may not be reliable always. However, the size of the bank, the volume of deposit and its profitability could be deemed as more reliable performance indicators (Okafor C. and Akadakpo A. (2014). In addition, there are variations of bank performance measurement. Revell (1980) uses interest margin as a performance measure for U.S. commercial banks. He defines interest margin as the difference between interest income and expense divided by total assets. Arshadi and Lawrence (1987) measure bank performance using normal correlation analysis. Their multidimensional indexes include indexes of profitability, pricing of bank services and loan market share. Profitability indicators, precisely the Return on sales (ROS), Return on Equity and the returns on Assets (ROA) and cost indicators, specifically total operating expense to sales (OEXP/S), General and Administrative expenses to sales G&AEXP/S and productivity measures total loans and deposits used to assess banks performance and productivity. These ratios are indicators of management efficiency, and rate of returns. These profitability measures vary substantially over time and from one banking market to another (Rose, 2001; Eyob Dagne, 2010 and Girma Amare, 2012).

The ROE and ROA are popularly in use today. The main drivers of banks' profitability remain earnings, efficiency, risk-taking and leverage. Various stakeholders (e.g. depositors, debt or equity holders and managers) emphasize different aspects of profitability. These views need to be taken into account by market participants (i.e. analysts, rating agencies, consultants and supervisors) when looking at ways of measuring bank performance that meet their needs. For this, each different group of market participants has its own preferred set of indicators. ROA is the major ratio that indicates the profitability of a bank. It is a ratio of income to its total asset (Khrawish, 2011). It measures the ability of the bank management to generate income by utilizing company assets at their disposal. In other words, it shows how efficiently the resources of the company are used to generate the income. It further indicates the efficiency of the management of a company in generating net income from all the resources of the institution (Khrawish, 2011). Wen (2010), states that a higher ROA shows that the company is more efficient in using its resources on the other hand the ROE measure, which is the ratio of net income to equity, serves as another indicator of a firm's net profit margin. Concerning cost measures, two cost related measures (ratios) are frequently used to measure relative performance: total operating expenses to sales (OEXP/S), and General and Administrative expenses to sales (G&A/S). Total operating expenses (defined as the sum of all operating expenses) serve as a proxy for the firm's total cost of operations. (Girma Amare 2012).

Measuring the Impact of IT on Banks Performance

Even though measuring the impact of information technology on firm's performance is difficult and yet have many dimensions, the benefits that can be obtained are undeniable. The objective of the study is to evaluate the impact of information technology investment on performance of financial institutions in Ethiopia specifically private commercial banks. Thus, the relation of information technology with both financial and non-financial measures of organization performance is reviewed under this section.

1. Profit Measures

A. Return on Asset (ROA)

A basic measure of bank profitability that corrects for the size of the bank is the return on assets (ROA), which divides the net income of the bank by the amount of its assets. ROA is a useful measure of how well a bank manager is doing on the job because it indicates how well a bank's assets are being used to generate profits. Measuring the performance of IT capital in

relation to ROA enables to determine the actual return of technological asset in relation to net income.

B. Return On Sales (ROS)

The ROS which is the ratio of net income to sales, serves as another indicator of a firm's net profit margin. The operating income to assets (OI/A) and operating income to sales (OI/S) ratios focus on operating returns only and exclude incomes earned by the firm from other sources such as gain on disposal of assets and from other extraordinary sources. Operating income is, therefore, regarded as a more appropriate measure of the direct value of IT (McKeen and Smith 1993, 1996) (Eyob Dagne, 2010).

C. Return On Equity (ROE)

It measures how efficiently a bank can use the money from shareholders to generate profits and grow. It is a profitability ratio from the investor's point of view. This ratio calculates how much Investment is made based on the investors' investment in the bank, not the company's investment in assets or something else (Molyneux, 1995), Belayneh (2011). The above discussed profit ratios are believed to indicate the impact of IT on the financial performance of firms more than any other financial ratio and are the closest area where the impact of IT can clearly be seen. (Eyob Dagne, 2010)

2. Cost Measures

A. Total Operating Expenses to Sales (OEXP/S)

The operating expense ratio is just one measurement of a company's performance. While it fails to provide complete insight into a company's financial health without the aid of other metrics such as free cash flow, price-to-earnings ratio and overall revenue growth over time, it does provide a quick reference for the company's overall profit margin. The operating expense ratio is one measure of how efficient a company is. Said another way, it indicates how much each dollar in sales revenue cost the company to achieve. An operating expense ratio 0.63 means that for every dollar of sales, the company spent 63 cents to create the sale. One of the most important considerations with this ratio is the direction it takes over time. An expense ratio that is increasing over time means the company is operating less efficiently from period to period.

B. General and Administrative Expenses to Sales (G&A/S)

General and Administrative Expense includes those costs that support the daily operations of a company, including legal, human resources, accounting, office supplies, advertising and marketing, payroll, rents, utilities, as well as executive salaries.

The sales to administrative expense ratio is an asset utilization measure that allows analysts to understand the level of overhead costs required to support a given level of revenues. Investor-analysts oftentimes track this ratio over time, since the ratio should decrease as a company achieves economies of scale.

1. Productivity Measures

The word product is an ambiguous term in banking industry .since it is service providing sector measuring and knowing of the actual output product is difficult. Berger and Humphrey (1992) has developed three major approaches to evaluate the outputs of banks, the assets approach, the user- cost approach and the value-added approach. Asset approach considers financial institutions are intermediators that mobilize deposits from surplus area to those areas with deficit of fund, as a result according to this approach banks output is composed of loans and other assets while inputs are deposits and other liabilities of banks. On the other hand the user cost approach studies the net contribution of each of the financial products to the bank's revenue. Depending on whether the product adds or detracts from the revenues of the firm, it becomes an output or an input (Prasad and Harker 1997). The value-added approach (or the activity approach as it is sometimes called) studies all Assets and liabilities as having some output characteristics without grouping them into exclusive input or output categories. Benston, Hanweck and Humphrey (1982) posit that "output should be measured in terms of what banks do that because operating expenses to be incurred." Following this line of thought, Berger and Humphrey (1992) argue that the value-added for each financial measure of the bank should be determined on the basis of operating costs and those that have "significant" value-added should be considered the outputs of the bank. (Prasad and Harker 1997 p10-11). Like that of financial measures the non-financial measures of information technology benefits are essential for evaluating the impact of information technology on organizations performance.

The non-financial measures such as product quality, market share, customer's satisfaction, and employees work quality and others can be measured based on subjective judgments. It is worth focusing on the non-financial performance metrics to assess the impact of IT on firm

performance because much of the investment on IT is aimed at improving the work process, customer satisfaction, product/service quality etc. by definition these variables are of intangible and non-financial, but very crucial in that the success or failure of a firm depends to a large extent by how well the firm excels on these areas. (Eyob Dagne,2010) said there is no single best way of measuring non-financial performances like quality of work process, product/service quality... etc., as a result any measure of these variables would be vulnerable for subjectivity and bias.

Empirical Review

Several studies over the years have been conducted both at industry and firm-level to examine the link between IT and productivity and the results were frequent from time to time. Earlier studies point out that the impact of information technology investments made on performance of organization was insignificant, which later referred as “productivity paradox”. Some studies have drawn on statistical correlation between IT spending and performance measures such as profitability or stock value for their analyses. Dos Santos (1993), Strassman (1990), Loverman (1994), Morrisson and Brendt (1990), Licht and Moch (1999) concluded that there is insignificant correlation between IT spending and profitability measures, implying thereby that IT spending is unproductive.

Measurement error, time lags, management error and redistribution were raised as major factors for insignificant relation observed between IT and organization performances (Karl Westerlind 2004). In addition even if Barua, Kriebel and Mukhopadhyay (1995) discussed on their findings that IT was positively related to some intermediate measures of profitability, but the effect was generally too small to measurably affect final output, on contrary Hitt and Brynjolfsson (1995) argued IT leads to increased productivity and consumer surplus, but not higher profitability.

Study made on relation between Nigerian banks and information technology stated that the deployment of IT facilities in the Nigerian Banking industry has brought about fundamental changes in the content and quality of banking business in the country (Oluwagbemi Oluwatolani, Abah Joshua and Achimugu Philip 2011). On the other hand Eyob Dagne (2010) reviled that there was no significant difference between banks with high IT capital and banks

with relatively low IT capital in Ethiopian commercial banks. Despite the fact that, in three of the four financial performance measures the banks with high IT capital have shown a slightly better financial performance, the difference when it is statistically measured was not significant. As a result the study concluded that high IT capital did not produce a superlative rate of return and did not help the banks with high IT capital to have a significant cost advantage over their counter parts with a relatively lower IT capital.

On the other hand some studies concluded that IT has significant impact on performance of organization. Dr. T. Sreelatha, CH. Sekhar (2012) conclude Information Technology course do promise to change the pace of banking to the next few years. Mobile banking and internet banking are going to make indoor in the banking sector in the near future. Even though IT systems are complex and sophisticated but they are “energy guzzlers”. Hence, the future for banking sector is going to make rapid straights in near future. In addition Cemal, Busra, Bulent and Ali (2010) studied the relationship between information technology (IT) investment level, IT usage and IT perception, IT at decision making process, future orientation, and technology orientation with firm performance in the comprehensive competitive environment and concluded that IT investments are vital component of firm performance. If firms manages IT investments successfully, it will enhance firm performance.

The study from Omri and Hachana (2008) attempted to identify the nature of relationship between IT and productivity of Tunisian banks by using Stochastic frontier approach, and concluded that IT played important role on the performance of banks and they further point out that x- efficiency is better way for explaining the relation between IT investment and performance than traditional ratios. Few years’ letter study made by Syrine Ben Romdhane (2013) Again justified the results of former researches made and demonstrated that IT is playing important role by positively and significantly affecting the cost efficiency of Tunisian banks. From the results of various studies made so far on the relation between IT investment and performance of organization specifically commercial banks around the world has different outcomes. At some point the results shows positive relationship on the other hand some studies reviled negative relationships.

Baccealli (2007) broaden the study of IT and performance link by studying the impact of IT on the efficiency of European banks. The author uses stochastic frontier approach (SFA) to estimate the efficiencies of costs and benefits for European banks, and concluded that IT had

positive long term contribution to long term costs (technical changes), thus reducing the actual costs of production by approximately 3.1% .in addition, the impact of technological changes on cost reductions consistently increased the studied period. Studies from (Daniel, Longbrake and Muerhy (1973), Kolari and Zardkoochi (1987), and Lawrence and Shay (1986)) on US banks further support the results of Baccealli thus the studies explore the impact of technological changes on the U.S banking sector concluded that there was a reduction in the processing costs of banking transactions along with decrease in banking employment.

RESEARCH DESIGN AND METHODOLOGY

Research Methodology

The researcher used quantitative methodology on which both quantitative correlation and regression analysis used to examine the impact of IT capital on the performance of private commercial banks in Ethiopia. To support the study the researcher used secondary data. Data was collected from published and audited financial statements of banks that cover a period of ten years starting from 2004/05 until 2013/14 fiscal year.

Population and sample size and design

In this study the target population is defined as financial service firms in Ethiopia; specifically the banking industry that have invested on software, hardware and networking equipment's and that has been in operation at least for ten years. Six private commercial banks are selected as a sample for the study and non-probabilistic sampling method specifically judgmental sampling method is used to select the sample. As a result the total sample of six banks selected and representing 38% of the total population of 16 banks.

Model Specification and Variable Identification

Cobb- Douglas production function model states that production is a function of capital and labor investment made. Where in its most standard form for production of a single good with two factors, the function is

$$Y = AL^{\beta}K^{\alpha}$$

Where

re:

Y = total production (the real value of all goods produced in a year)

L = labor input (the total number of person-hours worked in a year)

K = capital input (the real value of all machinery, equipment, and buildings)

A = total factor productivity

α and β are the output elasticity of capital and labor, respectively. These values are constants determined by available technology.

For many years the Cobb- Douglas function model has been one of the simplest model used on IT based production measure studies (see for example Loveman 1994, Lichtenberg 1995, Brynjolfsson and Hitt 1996, Prasad and Harker 1997, Clemons 1991). Furthermore researchers also use the same equation to test the relation between IT investment and profitability and market share. Production function model is the most famous framework used to evaluate return from information technology. Reason for selecting this model is due to difficulty to make cost benefit analysis associated with IT; the actual benefits are not easy to calculate. The production function can help to address this gap by relating IT spending to overall productivity or output measures. Previous studies further separated the IT-components of capital and labor expenses from the non- IT components, and used all four parameters as inputs in the Cobb-Douglas function to make relative comparisons about contributions to output, and the resulting marginal products (Brynjolfsson and Hitt 1996 and Prasad and Harker 1997).

By taking logarithm and adding error term we can linearize the above equation as the following

$$\text{Log } (Q) = \beta + \beta_1 \text{Log } (L) + \beta_2 \text{Log } (K) + \mu \dots \dots \dots 1$$

Where

e

Q ; Performance of Commercial Banks

ITC ; Log (K) capital investment, Log (L); labor, (β , β_1 , β_2); coefficient of variables

Independent Variables

To end the research model becomes as follows

$$\text{ROA} = \beta + \beta_1 \text{Log } (IT) + \beta_2 \text{Log } (LA) + \beta_3 (CA) + \beta_4 (MC) + \beta_5 \text{Log } (IN) + \mu \dots \dots \dots 2$$

Where

ROA ; Return on Asset, Log (IT); IT capital, Log (L); Labor, CA ; capitalization, MC ; Market concentration (banks share of loan), IN ; Inflation; β , β_1 , β_2 , β_3 , β_4 , β_5 ; coefficient of variables

IT capital-is the first independent variable measured by logarithm of banks annual investment on information technology products both hardware's and software's and annual IT related consultancy expenses. The reason for both hardware and software components used together is the fact that IT investment as described by various literatures and commercial banks in Ethiopia themselves as a combination of all IT related products which includes hardware, software, IT security and infrastructures and finally consultancy and maintenance related expenses. The expected relation with the profitability of banks is positive and significant. Since the objective of the research is to measure the impact of IT capital on performance of commercial banks, for the capital section of the model the researcher only uses the IT capital investment as independent variable. Performance of commercial banks is determined by many other factors other than IT. As a result the researcher used the following determinants of commercial banks performance as control variables.

Labor- considered as one factor that can determine the performance of commercial bank. Employee's efficiency measured as the ratio of annual labor cost to net income is expected to have negative relation with profitability of banks. Increase in annual labor cost to net income ratio implies that increase in inefficiency of labor capital as result inefficient labor decreases profitability of banks as the same time.

Capitalization: is included as a measure of the overall capital strength. The ratio is a measure of capital adequacy, and should capture the general average safety and soundness of the financial institutions. A deterioration of the equity-to-assets ratio indicates either an increase in debt financing of banks total assets (while holding total assets constant), or a decline in banks total assets (while holding total equity constant), or both over time and space. As a result in this study capitalization is measured as ratio of total equity to total asset. The higher the ratio the more capital concentration of banks is so that they are less risker in order to cover their liabilities as a result positive relation expected. Bank specific factors are not the only determinates of performance of commercial banks there are also industry and macro- economic determinates that can influence banks performance as a result to strength our model the following industry specific and macro- economic factors are added as control variables.

Market Concentration—market concentration is one of industry level determinants of performance of commercial banks. It is measured as individual banks loan share of total loan of the banking industry. Banks with highest loan share on which larger banks are expected to have

better chance of profitability emerged from interest income as a result positive relation is expected.

Inflation—inflation is one of macro-economic determinants of performance of commercial banks. in bad economic situation such as high level of inflation banks performance is likely to be affected negatively as a result negative relation is expected to be observed.

Return on Asset- is one of the major performance measurement of commercial banks.it is measure of how much profit is generated per asset invested it reflection of how efficiently banks are using their asset level, as a result ROA is dependent variable and measured as

$$ROA = \text{Net Income} / \text{Total Assets}$$

Table-1 Summary of Variables to be tested measurement, expected sign and significance

Variables	Measurement	Notion	Expected Result
IT Capital	Annual IT Capital	IT	+/Sig
Labor	Annual Sal & Ben Exp/Net Income	LA	-/in Sig
Capitalization	Total Equity /Total Asset	CA	+/Sig
Market Concentration	Banks Share of Total Loans	MC	+/Sig
Inflation	Consumer price index	IN	-/Sig
Return On Asset	Net Income/Total Asset	ROA	

Data Analysis, Results and Discussion

This section presents the impact of IT capital investment on the performance of private commercial banks in Ethiopia. The analysis is made using annual balanced panel data, where all the variables are observed for each cross-section and each time period. The study has a time series segment spanning from the period of 2005 up to 2014 and a cross section segment which considered six private commercial Banks.

Descriptive Statistics

Table-2 presents the outcomes of the descriptive statistics for all variables involved in the regression model from 60 observations. The dependent variable is ROA and remaining are independent variables (IT, LA, CA, MC and IN). Key figures, including mean, median, standard deviation, minimum and maximum values are reported. This was generated to give overall description about data used in the model and served as data screening tool to spot unreasonable figures

Table-2 Descriptive Statistics Results

	ROA	IT	LA	CA	MC	IN
Mean	0.028357	17.33312	0.457460	0.125362	0.066500	0.170800
Median	0.029104	17.45062	0.391137	0.117075	0.061601	0.146500
Maximum	0.043636	19.49128	2.717477	0.192177	0.155819	0.364000
Minimum	0.003901	14.50979	0.210686	0.071022	0.000000	0.028000
Std. Dev.	0.006278	1.176412	0.321316	0.031605	0.028984	0.110152
Observations	60	60	60	60	60	60

Source: computation on

Eviews 8.0

From the above table, it is shown that out of 60 observations made, commercial banks in Ethiopia obtained average of 2.8% profit in terms of ROA on the past decade, with maximum of 4.3% and minimum of 0.39% values respectively. That means the most profitable banks earned 4.3% of profit after tax for a single birr invested in the assets of the firm. On the other hand, the least profitable banks managed to earn 0.39% of profit after tax for each birr invested in the assets of the firm. The standard deviation statistics for ROA was 0.006, which indicates that the profitability variation between the selected banks was very small. The result implies that these banks need to optimize the use of their assets to increase the return on their assets. While looking at the study variable IT capital, commercial banks have managed to invest average of 17.33 million birr on information technology related products for the past ten years. High intensive IT investing banks invests 19.49 million birr while banks found in low IT capital investing group witnessed 14.50 million birr investment. The standard deviation value of 1.176 shows there is bigger variation between the two groups.

Correlation Matrix of Variables

Correlation is used to identify the degree of linear association between variables. Values of the correlation coefficient are always ranged between +1 and -1. A correlation coefficient of +1 indicates that the existence of a perfect positive association between the two variables; while a correlation coefficient of -1 indicates perfect negative association. A correlation coefficient of zero, on the other hand, indicates the absence of relationship (association) between two variables (Brook, 2008). The following table presents the correlation matrix among variables under study showing the relation of independent variables with the dependent variable.

Table-3 correlation matrix of dependent and independent variables

	ROA	IT	LA	CA	MC	IN
ROA	1.000000					
IT	0.194619	1.000000				
LA	-0.625412	-0.020983	1.000000			
CA	0.532317	0.000910	-0.096614	1.000000		
MC	-0.237015	0.055451	-0.016586	-0.589093	1.000000	
IN	0.188953	0.078375	0.072148	0.087790	-0.080160	1.000000

Source: computation on Eviews

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From the above table, it is shown that except for labor and market concentration the rest explanatory variables have positive correlation with the dependent variable ROA. Capitalization is the most positively correlated variable with return on asset, showing that increase in equity capital of banks results increase in ROA. This is also true for inflation variable. On the other hand IT capital is also positively related with ROA, even though the coefficient of correlation is not significant. Labor efficiency and market concentration appears to have negative correlation with ROA. This means as labor related expense per unit of net income increases ROA of banks decreases.

Hausman Fixed Random Effects Model Test

The results of the regression model are provided by the software program Eviews 8, using panel estimate approaches: the fixed effects model (FEM) and random effects model (REM). According to Gujarati (2004), if T (the number of time series data) is large and N (the number of cross-sectional units) is small, there is likely to be little difference in the values of the parameters estimated by fixed effect model (FEM) and random effect model (REM). In order to check of which of two models is appropriate, Hausman test is used on which the null hypothesis of the Hausman test proposing random effect model is appropriate. Table 4.6 shows that, the p-value for the test is > 0.05 , which indicates that the **null hypothesis is not rejected**.

Table-4: Hausman fixed/random model test result

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	0.000000	5	1.0000

P value of the above table is 1.0000, that null hypothesis of Hausman test is failed to be rejected as a result random effect model (REM) is selected for interpretation.

Test of Classical Linear Regression Assumptions

There are five basic Classical Linear Regression Model assumptions needs to be encounter so that the estimation technique, OLS, had a number of desirable properties, and also the hypothesis tests regarding the coefficient estimates could validly be conducted (Brooks 2008). If these Classical Linear Regression Model (CLRM) assumptions hold, then the estimators determined by OLS will have a number of desirable properties, and are known as Best Linear Unbiased Estimators (BLUE). Therefore, for the purpose of this study, diagnostic tests are performed to ensure whether the assumptions of the CLRM are violated or not in the model. Performing all the diagnostic test and found no violation of assumptions

Regression Results and Interpretations

Here under the results from regression analysis is present with interpretation of coefficient results. Beta coefficient describes the explanatory variables influence on the dependent variable, it may be either positive or negative which describes the direction of relation and the respective P-value indicates at what percentage or precession level of each variable is significant. R² values indicate the explanatory power of the model and in this study adjusted R² value which takes into account the loss of degrees of freedom associated with adding extra variables were inferred to see the explanatory powers of the models.

$$ROA = \beta_0 + \beta_1 \text{ Log (IT)} + \beta_2 \text{ Log (LA)} + \beta_3 \text{ (CA)} + \beta_4 \text{ (MC)} + \beta_5 \text{ Log (IN)} + \mu \dots \dots \dots 5$$

Where

e

ROA; Return on

Asset

Log (IT); IT capital, Log (L); Labor, CA; capitalization, MC; Market concentration (banks share of loan), IN; Inflation.

β , β_1 , β_2 , β_3 , β_4 , β_5 ; coefficient of variables

As one measure of profitability of commercial banks the impact of information technology on ROA is regressed and the first hypothesis is tested.

From the regression output below it can be observed that out of five explanatory variables four of them have statistically significant effect on the ROA with 1% and 5% level of significance.

The value of R^2 and adjusted R^2 which is 64% and 61% respectively shows the changes on independent variables explained 61% of changes on the dependent variable ROA. From the above values it can be indicated that the explanatory power of selected variables is good while explaining the effect on the dependent variable. The null hypothesis of F-statistic (the overall test of significance) that the R^2 is equal to zero was rejected at 1% as the p-value was sufficiently low. P (F-statistics) value of 0.000 indicates strong statistical significance, which enhanced the reliability and validity of the model.

Table 4.8: Regression Analysis Result for Return on Asset (ROA)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.016366	0.005424	3.017232	0.0039*
IT	0.000467	0.000421	1.109740	0.2720
LA	-0.010885	0.001618	-6.727048	0.0000*
CA	0.071390	0.028166	2.534649	0.0142**
MC	-0.027454	0.010408	-2.637692	0.0109**
IN	0.010293	0.004317	2.384305	0.0207**
R-squared	0.644169	Mean dependent var		0.012121
Adjusted R-squared	0.611221	S.D. dependent var		0.005191
S.E. of regression	0.003237	Sum squared resid		0.000566
F-statistic	19.55146	Durbin-Watson stat		1.912511
Prob(F-statistic)	0.000000			

**and **denote significance at 1%, 5% levels respectively.*

Source: Eviews output

Where our model with results became

$$\text{ROA} = 0.016366 + 0.000467\text{IT} - 0.010885\text{LA} + 0.071390\text{CA} - 0.027454\text{MC} + 0.010293\text{IN}$$

The following section presented with the summary of major findings and test of hypothesis constructed.

IT capital: coefficient of IT capital shows positive relation with ROA. On which holding other factors constant 1% increase on IT capital investment leads to ROA increases by 0.000467 units, but it is statistically insignificant. From this result it can be understood that even though commercial banks manage to generate positive return from capital investments on technological products the benefit they are getting is not significant. On the other hand positive relation between technological investments and profitability reverses the “**productivity paradox**” theory for commercial banks in Ethiopia.

Labor: man power is one of the major resources of a given organization, employee’s efficiency in productivity is required in order banks to obtain maximum profit. Holding all other factors constant when labor cost per net income increases by 1% ROA will decrease by 0.010885 units and the relation is statistically significant at 1%. When referring to previous studies, Samuel Alemu (2015) found negative and insignificant relation between commercial banks employees’ efficiency while Alemu and Mekuria (2013) found a significant negative relationship between labor efficiency and bank profits. The result shows that the Ethiopian Banking industry may not truly benefited from staff efficiency.

Capitalization: banks with highest equity – asset ratio are perceived to be less riskier than those with low ratio, as a result the variable expected to have positive relation with ROA. Coefficient of capital which is measured by equity to total asset ratio is positive and statistically significant at

5%, which means increase in capitalization of Ethiopian commercial banks resulted increase on ROA. Earlier studies made in Ethiopian commercial banks also point out that capital has positive and dominant influence on the performance of commercial banks (Abebaw and Depaack 2011, Birhanu Tsehay 2012 and Samuel Alemu 2015). On the other hand Mulualem Getahun (2015) found negative relation between ROA and capital adequacy of Ethiopian commercial banks.

Market concentration: banks with high market share perceived to have better chance of profitability in relation to those banks with low market share. In non-competitive market larger banks with high loan concentration can increase their profitability by increasing their lending interest rate and decreasing interest rate on deposits. But large loan concentration can also result risk of loan defaults, which may result in negative effect on the profitability of banks. Coefficient of banks loan concentration is negative and significant means larger banks are not benefited from their highest loan share of the industry.

Inflation: it is expected that increase on inflation rate has negative relation with performance of banks. Some studies disprove this argument by showing positive relation with inflation and banks profitability. Holding other factors constant, banks used 1% increase on inflation to increase ROA by 0.010293 units which is statistically significant at 5%.

Prior studies explained the rationale behind positive relation between inflation and banks profitability as once banks are able to anticipate inflation, it will give them chance to adjust interest rates accordingly as a result they will be able to increase revenues faster than increase in costs which will result in increase in profitability.

Summary of Findings

In the context of the study the researcher examines the relationship between IT investments and performance of private commercial banks in Ethiopia, using panel data of six private commercial banks covering ten years from 2005 to 2014. Applying quantitative research approach the researcher addresses both general and specific objectives of the study. In this study it is observed that a capital investment on Information technology has been increasing from time to time with more technological advancements in private commercial banks in Ethiopia. Banks are investing on IT related products and services such as: software, hardware, infrastructure and networks, consultancy and maintenance services. Main motivational factors for banks to invest huge amount of money on IT include delivering quality customer services, increasing efficiency and effectiveness and to be competitive and leading in the fast growing banking industry. Looking at overall IT capital, it can be seen that technological products investment is holding large portion of overall capital investment decisions made, the average percentage of IT capital share in relation to total fixed asset of banks is near to 50%, which shows banks are investing on IT related products aggressively. From the regression output apart from IT capital the rest control explanatory variables have significant relationship with performance measure ROA of commercial banks on which labor efficiency and market

concentration shows negative relation but the rest two variables capitalization and inflation shows positive relation with ROA. Looking at coefficient of IT capital from the regression result, it is confirmed that technological products have positive impact on the performance of commercial banks in Ethiopia but the degree of relation is insignificant when measured statistically.

Even though banks are getting positive return on IT investments made, there are a lot of factors observed restricting them from being advantageous as expected. There are many justifications stated on the study can be mentioned as a causes for the above results. At the beginning it is observed that in most private commercial banks investments on IT is at the early stage and made mainly for survival strategy. Most of the time banks are intended to serve customers with low service charges in order to mobilize deposits and to attract customers. On the other hand, the new technological futures banks are introducing such as internet banking are at early stage of implementation on which returns are not yet captured. Low performance of major infrastructural facilities like electricity and network coverage prohibits banks from fully utilizing IT infrastructures. In addition, banks poor management and lack of control over technology contributes for the low outcome. Employees' resistance to technology and lack of adequate knowledge to the system implemented significantly affected the function of IT related investment. Poor quality of IT infrastructure installation and implementation can also be mentioned as problems.

Conclusions

In general from the study result, the researcher concluded that information technology is essential resource in commercial banks in Ethiopia and even though the degree of impact is not significant, commercial banks are generating additional profit from capital investment decisions made on IT. In addition the researcher concluded that information technology investments decision makings and management is poor among private commercial banks and banks are not working on full capacity in order to utilize those investments to the maximum limit. Finally, it is believed that private commercial banks are on the right track for selecting and using Information technology as one survival strategy, as a means to enhance customer service quality and increase work efficiency. However, large amount of investment will continue to deliver less benefit if not managed well.

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