

**EFFECT OF TECHNOLOGY ADOPTION ON OPERATIONAL
EFFICIENCY OF COMMERCIAL BANKS IN KENYA**

BY

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DECLARATION

STUDENT'S DECLARATION

This Research Project is my original work and has not been presented in any other University.

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SUPERVISOR'S DECLARATION

This Research Project has been submitted for presentation with my approval as University Supervisor.

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DEDICATION

I dedicate this work to my family. Their prayers and guidance has been tremendous.

Thank you for the immense support. God bless you all.

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ABSTRACT

Banks, like other service organizations, strive to improve customer service level and tie their customers closer. Technology is one leading driving force nowadays, in different businesses. Technology has become an intrinsic part of banking, making it easier and cheaper to develop and deliver financial services. As a consequence of the highly technological environment developed around the world in the banking industry, the expansion of distribution channels for financial services relies on a very complex network of partnerships. With competition in the banking sector becoming intense and new financial service providers emerging all the time, this could result into the banks inability to function effectively and efficiently. The purpose of the study was to establish the effect of technology adoption on operational efficiency among commercial banks in Kenya. This study adopted the descriptive research design based on the key areas of interest. The population of interest in this study comprised of the 43 commercial banks operating in Kenya as at December 2013. The study took a census approach since the population was not big. In this study emphasis was given to secondary data which was obtained from the financial results filled at Central Bank of Kenya and Annual Banking Survey reports. The data included the actual financial statements data covering the period between 2009 and 2013. The study used both descriptive and inferential statistics in analyzing the data. Analysis was done with the help of Statistical package for social sciences (SPSS version 21). Descriptive statistics such mean score, frequencies and percentages for each variable was calculated and tabulated using frequency distribution tables and graphs. In order to test the relationship between the variables the inferential tests including the regression analysis was used. Regression analysis was therefore used to determine the relationship between variables in the study. From the regression model, the study found out that there were technology adoption variables influencing the operational efficiency of commercial banks in Kenya, which are ATM cards, debit and credit cards, internet banking and mobile banking. They all influenced it positively. The study found out that the intercept was 0.514 for all years. The four independent variables that were studied (ATM cards, debit and credit cards, internet banking and mobile banking) explain a substantial ATM cards, debit and credit cards, internet banking and mobile banking 70.5% of operational efficiency among commercial banks in Kenya as represented by adjusted R^2 (0.705). The study established that the coefficient for ATM cards was 0.724, meaning that ATM cards positively and significantly influenced the operational efficiency of commercial banks in Kenya. The study also established that the coefficient for debit and credit cards was 0.368, meaning that debit and credit cards positively but significantly influenced the operational efficiency of commercial banks in Kenya. The study further revealed that the coefficient for internet banking was 0.405 meaning that internet banking positively and significantly influences the operational efficiency of commercial banks in Kenya. The coefficient for mobile banking was 0.529, this shows that mobile banking significantly and positively influences the operational efficiency of commercial banks in Kenya. The study therefore concludes that technology adoption positively and significantly influences operational efficiency of commercial banks in Kenya.

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LIST OF ABBREVIATIONS AND ACRONYMS

ATMs	Automatic Teller Machines
CBK	Central Bank of Kenya
CRS	Constant Returns to Scale
DCF	Direct Credit Facilitation
DEA	Data Envelopment Analysis
EFT POS	Electronic Funds Transfer Point of Sale
ES	Efficiency Structure
FA	Fixed Assets
IB	Internet Banking
ICT	Information Communication Technology
IT	Information Technology
KIB	Kenya Institute of Bankers Association
LAB	Labor
M&A	Mergers and Acquisitions
MB	Mobile Banking
MP	Market Power
MPT	Modern Portfolio Theory
OEA	Other Earning Assets
POS	Points-Of-Sale
RMP	Relative Market Power
SCP	Structure-Conduct Performance
SPSS	Statistical package for social sciences
SSA	Sub-saharan Africa
TD	Total Deposits
VRS	Variable Returns To Scale

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Commercial banking has never been more important to our society than it is today. Gates (2008) announced that banking is essential, banks are not. This quotation means that the traditional banking is going to vanish in order to be surrogated by electronic banking which continues to attract new users. Banks, like other service organizations, strive to improve customer service level and tie their customers closer (Graven, 2012). Technology is one leading driving force nowadays, in different businesses (Tavares, 2012).

Technology has become an intrinsic part of banking, making it easier and cheaper to develop and deliver financial services. As a consequence of the highly technological environment developed around the world in the banking industry, the expansion of distribution channels for financial services relies on a very complex network of partnerships (Costa et al, 2007). At the same time, in developing countries, only part of the population has access to basic financial services, such as a deposit account, for example. Recent advances in technology have created a surge in technology-based self-service (Dabholkar et al, 2003). A number of studies (Stegman et al, 2005) have claimed that technology will play a significant role in improving people's bank access, taking financial services in a sustainable way.

The use of IT is widespread, from the most developed countries through the developing countries to the least developed countries, although the extent of overall use is directly related to the level of development. Commercial banks, since they are highly information intensive, have invested in IT extensively. Even in a country like Nepal, a developing country still at the lower rungs of the development ladder, new

banks in the near past years started their operations with computerized systems. In Thailand, another developing country that is trying to climb on to the developed platform, commercial banks have computerized operations, and many of their services/products are IT based. In developed countries like the US and Canada, IT has become a necessity for financial institutions if they want to survive in the market, and the financial institutions keep on trying to come out with new services/products which are IT based (Pritam, 2002).

Finally, the automation of banking services will encourage the adoption of a decentralized approach to give banks more needed flexibility to become accessible to a much larger number of potential customers. This will enable banks to achieve efficiency and operate effectively. Operational efficiency refers to the ability to work well and produce good results by using the available time and suppliers in the most effective way (Rainer, 2003). It can also refer to how much resources are consumed in achieving the output relative to the amount that was forecasted as required. Therefore the aim of operational efficiency is to economize the human activities and maximize productivity (Lysons, 2006).

Implementing new technology offers an organization various benefits and they include; reduced competition and aggregation of demand, increased compliance monitoring, allows employees to serve the clients faster and diligently, time saving, improves customer relationships, reduced administrative costs and it has also facilitated swiftness in transactions hence improving on the financial results (Whiteley, 2012). However, adopting new technology in an organization is still difficult as it is costly in terms of implementation and maintenance, training employees on how to operate it is challenging and also there is loss of direct relationship between the clients and the service providers (Lysons, 2006). Thus, the

focus of organization's choice to adopt technology and therefore automate the activities is on making its operations more efficient in transactions and therefore reducing costs and saving time in its operations. As a result, adoption of new technologies is seen as an opportunity to improve not only efficiency and effectiveness but also the quality of services with more emphasis in the technological as well as organizational changes needed in order to efficiently use electronic procurement in future for any flourishing organization.

1.1.1 Technology Adoption in the Banking sector

Information Technology (IT) is a man-made resource, embracing principally the electronic technologies of computers and telecommunications (voice, data, and video), and comprising of both electronic hardware and computer software. Banks are using information technology more and more in delivering transactions. As elsewhere in the world, SSA banking systems have seen many technological changes. Most of them for example, computerization of bank processes and using Automated Teller Machines (ATMs) were introduced by foreign banks, who imported them from their headquarters. Anglophone countries like Uganda, Nigeria, and South Africa seem to have more ATMs than Francophone countries. The creation of mobile banking units in Uganda and the use of chip/fingerprint technology in Malawi to increase access to financial services are other examples of technology adoption. Other studies pinpoint the impact of foreign bank entry into developing countries. In SSA, foreign banks hold a large share of banking system assets. They bring expertise and help enhance banking system efficiency. Kirkpatrick, Murinde and Tefula (2008) found in their study of Anglophone SSA countries that the degree of foreign bank penetration is inversely related to inefficiency, suggesting that foreign bank ownership in Africa has contributed to better management and performance of commercial banks.

Similarly, in a study of 11 transition economies, Bonin, Hasan and Wachtel (2005) provide evidence that foreign owned banks collect more deposits and make more loans than domestic private banks, and are more efficient in the distribution of financial services in those countries. The above findings use case studies of East Africa basing on the performance of foreign commercial banks. Their findings indicate that foreign bank ownership has improved on the performance of commercial banks. However, the generalizations do not reflect the particular rating of the performance of Post bank and takes no effort to emphasize operational efficiency, which provides basis for conducting the current study.

1.1.2 Operational Efficiency

Efficiency in banking has been defined and studied in different dimensions including : (i) scale efficiency, which refers to relationship between the level of output and the average cost; (ii) Scope efficiency, which refers to relationship between average cost and production of diversified output varieties; and (iii) Operational efficiency, a wide concept sometimes referred to as x-efficiency, which measures deviation from the cost efficient frontier that represents the maximum attainable output for the given level of inputs. With reference to various definitions, inefficiency is therefore a multifaceted concept with several meanings depending on the perspective in which it is used (Leibenstein, 1966).

Scale and scope economies for example, are achieved from the firms' output expansion resulting in an increase in the industry's output. And that reduces costs of production thus leading to the strong technological external economy. Hirshleifer and Glazer (1993) argue that scope economies occur where it is cheaper to produce

varieties in a plant than in separate plants, and this is the concept from which banking consolidation stems.

Efficiency represents the ability of management to control costs and use resources available to produce output. Although a primary goal of deregulation is to improve efficiency, numerous studies examining the impact of financial reforms on banking performance and efficiency provide mixed results. Some studies suggest that financial reform improves efficiency. Kumbhakar and Sarkar (2003) analyzed the relationship between deregulation and performance improvement using data from the Indian banking industry over a 12-year period from 1985 to 1996. They found that the performance of private, but not public, banks improved in response to deregulation measures. Recently, Das and Ghosh (2006) used DEA to evaluate the efficiency of Indian commercial banks during the post reform period of 1992-2002. They found that medium-sized public banks performed reasonably well and efficiency improved.

The efficiency of banks can be accessed through indicators of financial soundness. Changes in those indicators are noticeable for SSA since the banking reforms of the 1990s. For instance, total problem loans as percent of assets decreased by 0.9 percent after the restructuring; they equaled 8.3 percent in 2003. SSA banks increased their capital as share of assets to 18.9 percent the same year against 14.5 percent during the 1990s. Hauner and Peiris (2005) investigated whether the banking sector reforms undertaken in Uganda to improve competition and efficiency have been effective. Cihak and Podpiera (2005), studying East African banking reforms, found that the banking systems of Kenya, Tanzania, and Uganda were inefficient and had only a limited intermediation role, despite recent reforms and even with international banks present.

1.1.3 Technology Adoption and Operational Efficiency

Banks have largely implemented service delivery technology as a way of augmenting the services traditionally provided by bank personnel. Implementation results both from the need to reduce the cost of delivering service primarily through personnel, and, the corresponding need to meet the challenge posed by technologically innovative competitors (Byers & Lederer, 2001). Changes in the banking industry such as those resulting from deregulation, rapid global networking, and the rise in personal wealth have thus made the implementation of sophisticated delivery systems (e.g. online and telephone banking, remote site automated teller machines, etc.) a strategic necessity in many cases.

Financial services industry over time has opened to historic transformation that can be termed as e-developments which is advancing rapidly in all areas of financial intermediation and financial markets such as e-finance, e-money, electronic banking (e-banking), e-brokering, e-insurance, e-exchanges, and even e-supervision. The new information technology (IT) is turning into the most important factor in the future development of banking, influencing banks' marketing and business strategies. In recent years, the adoption of e-banking began to occur quite extensively as a channel of distribution for financial services due to rapid advances in IT and intensive competitive banking markets (Mahdi & Mehrdad, 2010). These factors make it complicated to design a bank's strategy, which process is threatened by unforeseen developments and changes in the economic environment and therefore, strategies must be flexible to adjust to these changes.

Technological developments have removed repetitive, time consuming tasks, reduced human error and extended access to banking related facilities. Technology also provides customer information that it would be much more expensive to provide on a

person-to-person basis. Telephone banking facilities allow non-cash transactions to be carried out, which would have required a visit to a branch earlier. Similarly, Internet banking allows customers to perform tasks at a time and in a place convenient to them. Dabholkar (2009) suggests that direct contact with such technology also gives customers a feeling of greater control. Smith (1987) is of the opinion that technology was introduced in banks originally to reduce costs but that, by dividing front and back office operations, technology can be targeted to enhance different functions. The dilemma still remains, however, as to how to maintain a satisfactory number of face-to-face interactions with the customers.

The improvement in information and communication technology (ICT) has enhanced the creation of new business models and has revolutionized the distribution channels of financial systems resulting in not only a reduction in the transaction costs but also has improved the convenience and accessibility for the customers (Devlin, 1995). According to Norton (1992) and Mishkin and Strahan (2009) this is a key factor that is transforming the financial system. On the same note, improvement in information technology also makes it easier for investors to monitor corporations, thus reducing asymmetric information. As such, banks which have not invested significant amounts in technology have consequently faced an erosion of their market shares to other non-banking institutions. Technological advances facilitate the rapid transmission of digitized information within and across borders, which is becoming increasingly important for successful banking transactions as financial services are largely informational in nature (Bradley & Steward, 2002).

1.1.4 The Commercial Banking Sector in Kenya

The banking industry in Kenya is governed by the Companies Act, the Banking Act, the Central Bank of Kenya Act and the various prudential guidelines issued by the Central Bank of Kenya (CBK). The banking sector was liberalized in 1995 and exchange controls lifted. The CBK, which falls under the Minister for Finance's docket, is responsible for formulating and implementing monetary policy and fostering the liquidity, solvency and proper functioning of the financial system. The CBK publishes information on Kenya's commercial banks and non-banking financial institutions, interest rates and other publications and guidelines (Central Bank of Kenya, 2010).

Kenya banking sector has witnessed many changes since the beginning e-banking. Today, customers of banks have efficient, fast and convenient banking services. In line with rendering qualities and acceptable services, most banks in Kenya are investing large sum of money in information and communication Technology. While the rapid development of information technology has made some banking tasks more efficient and cheaper, technological investments are taking a larger share of bank's resources. Currently, apart from personnel costs, technology is usually the biggest item in the budget of a bank, and the fastest growing one. Another problem associated with this financial innovation plastic card fraud, particularly on lost and stolen cards and counterfeit card fraud. Banks need to manage costs and risks associated with electronic banking.

Since most banks offer comparable products and services, they continually search for a competitive advantage that will attract new customers and help them retain existing ones. Banks therefore, must endeavor to develop innovative programs and initiatives

to maintain superior customer service levels while remaining profitable guidelines (Central Bank of Kenya, 2010). Over the last few years, the Banking sector in Kenya has continued to grow in assets, deposits, profitability and products offering. The growth has been mainly underpinned by; an industry wide branch network expansion strategy both in Kenya and in the East African community region and automation of a large number of services and a move towards emphasis on the complex customer needs rather than traditional ‘off-the-shelf’ banking products.

1.2 Research Problem

In most developed countries, technology is a central element to deal with challenges in modern banking, such as lowering costs and enabling efficiency improvements. Certainly, most banks worldwide are highly successful at utilizing ICT to provide efficient banking services to their customers. In recent years, a number of technology initiatives for delivering banking services have appeared in different developing countries (Lysons, 2006). Technologies such as ATMs, mobile phones and points-of-sale (POS) have been used to reduce costs and make clientele profitable to banks. There is a tremendous opportunity for banking technology to connect to clients at reduced costs and bring millions of consumers to the formal financial marketplace through electronic channels (Rainer, 2003). The application of new technologies has been proven as an effective way to reduce the costs of operation for the financial institutions. For instance, it will allow banks to reduce expenditures on physical structures. Thus, commercial banks consider the adoption of ICT as a means to increase the banks’ efficiency and performance as well as quality of service.

In the last decades, commercial banks in Kenya have been faced with a number of fundamental changes, different forms of government intervention, tighter business

competition, more demanding customers, increasing cost of developing new financial products and services, and recent mergers and acquisitions (M&A) of financial firms which have affected their operational capacities. Commercial banks have kept up introducing a variety of new products and services, but many of the initiatives are half-hearted and seem isolated from the typical business processes of the banks (Akamavi, 2005). To correct these defects and offer quality services to the customers, commercial banks in Kenya have embraced technological innovations and use of modern gadgets. However, many organizations today after failing to fully implement new technologies because it involves a lot of the organizations financial commitment, have not achieved the objectives of technology adoption (Nakajje, 2011). It is not clear whether automation of banking activities by management has represented a positive change and enhanced operational efficiency since it continues to have long queues, is vulnerable to cheating by some clients who bank fake notes, and is largely concentrated in urban centres which are habited by less than 20% of the Kenyan population (Mugambi, 2006). With competition in the banking sector becoming intense and new financial service providers emerging all the time, this could result into the banks inability to function effectively and efficiently. It is therefore upon this statement that the researcher seeks to undertake to find out how adoption of new technologies has impacted on operational efficiency in commercial banks in Kenya.

Despite the undeniable importance of technology in banking operations, the impact on operational efficiency is still misunderstood. Previous studies have produced mixed results regarding the impact of technology on banking sector operational efficiency with some concluding that technological innovations had least impact on bank operations and others indicating a significant contribution to bank operations. It is at the center of such mixed conclusions that creates and necessitates the need to carry

out a study from a Kenyan context to establish the effect of bank technologies on operational efficiency in commercial banks in Kenya. Further, previous studies in Kenya concentrated on the relationship between e-banking and financial performance (Bichanga & Ali, 2014; Asiabugwa & Munyoki, 2013), adoption and effectiveness of electronic banking and effects of banking sectoral factors on the profitability of commercial banks in Kenya (Mwai, 2013; Aduda & Kingoo, 2012; Oluoch, 2012). None of them has ever focused on the effect of technology adoption on operational efficiency of commercial banks in Kenya.

The study sought to answer the following research questions: What is the level of technology adoption among commercial banks in Kenya? What is the effect of technology adoption on operational efficiency among commercial banks in Kenya?

1.3 Objectives of the study

1.3.1 General objective

The main objective of the study was to establish the effect of technology adoption on operational efficiency among commercial banks in Kenya.

1.3.2 Specific objectives

The Study objectives were:

- i. To determine the level of technology adoption among commercial banks in Kenya
- ii. To assess the effects of technology adoption on operational efficiency among commercial banks in Kenya.

1.4 Value of the Study

The study will benefit the management of commercial banks in Kenya by helping them understand the need for operational efficiency. In light of the stated objectives

which this study is set to achieve, the study will justify the adoption of technology on banking services delivery and identify the contribution of each technology to operational efficiency. It will also help to find out the reasons why banks today have to forgo their former ways of operation to modern banking such as ATMS, Mobile banking, EFT POS and Internet Banking among other technologies and as such identify the problems arising from the operational systems of the commercial banks in Kenya.

The study will also benefit operational efficiency entrepreneurs who provide the technology infrastructure in learning how to manage their contractual relationship with their principals who are licensed commercial banks in Kenya. This will help foster better relationship between the two parties.

It will as well contribute to existing literature by identifying the most effective technologies to be adopted and promoted in the banking sector in Kenya. The study will also be a valuable source of information to students, academic institutions, and individuals that want to know more about the relationship between the use of technology and operational efficiency among commercial banks in Kenya.

The study will also be used as a reference point for material on the relationship between operational efficiency and adoption of technology by commercial banks. Other researchers in the same field will also have an easy time determining what have been done in the area so far to know which point of view they will base further studies on. The study will also propose areas for further study which will ease the earlier mentioned process.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presented the study objectives against the background of other knowledge from other scholars and researchers. It comprised theoretical and empirical reviews and finally a conclusion.

2.2 Theoretical Review

2.2.1 Market power and Efficiency Structure Theories

Studies on the performance of banks started in the late 1980s/early 1990s with the application of two industrial organizations models: the Market Power (MP) and Efficiency Structure (ES) theories (Athanasoglou, Brissimis & Delis, 2006). The balanced portfolio theory also added greater insight in to the study of bank profitability (Atemnkeng & Nzongang, 2006). Applied in banking the Market Power hypothesis posited that the performance of banks was influenced by the market structure of the industry. There were two distinct approaches within the MP theory; the Structure-Conduct Performance (SCP) and the Relative Market Power hypothesis (RMP). According to the SCP approach, the level of concentration in the banking market gave rise to potential market power by banks, which raised their profitability.

Banks in more concentrated markets were most likely to make abnormal profits by their ability to lower deposits rates and to charge higher loan rates as a results of collusive (explicit or tacit) or monopolistic reasons, than firms operating in less concentrated markets, irrespective of their efficiency (Tregenna, 2009). Unlike the SCP, the RMP hypothesis posited that bank profitability was influenced by market share. It assumed that only large banks with differentiated products can influence prices and increase profits. They were able to exercise market power and earn non

competitive profits. The ES hypothesis, on the other hand posited that banks earned high profits because they were more efficient than others. There were also two distinct approaches within the ES; the X-efficiency and Scale-efficiency hypothesis.

Based on the X-efficiency approach, more efficient firms were more profitable because of their lower costs. Such firms tended to gain larger market shares, which manifested in higher levels on market concentration, but without any causal relationship from concentration to profitability (Athanasoglou, Brissimis & Delis, 2006). The scale approach emphasized economies of scale rather than differences in management or production technology. Larger firms could obtain lower unit cost and higher profits through economies of scale. This enabled large firms to acquire market shares, which manifested in higher concentration and then profitability.

Athanasoglou et al. (2006) argued that profitability was a function of internal factors that are mainly influenced by a bank's management decisions and policy objectives such as the level of liquidity, provisioning policy, capital adequacy, expense management and bank size, and the external factors related to industrial structural factors such as ownership, market concentration and stock market development and other macroeconomic factors. The above theoretical analysis showed that MP theory assumed bank profitability was a function of external market factors, while the ES and Portfolio theory largely assumed that bank performance was influenced by internal efficiencies and managerial decisions (Olweny & Shiphoo, 2011).

2.2.2 Neo-Classical Theory

The concept of technical efficiency derives its basis in the neo-classical theory of the firm and assumes profit maximizing behavior. A firm or a bank may be technically inefficient for technical reasons such as low training or low human capital levels of

managers and workers, or the use of inferior or out-of-date technology. The diffusion of new technology is not instantaneous and some firms or banks may lag behind others in the acquisition and utilization of new technology. With further training and updating of capital, the firm or bank can expect to move towards the efficient frontier (Cooper et al, 2003). X-inefficiency is not caused by the variability of skills or the time variability of technology diffusion but by the use and organization of such skills and technology.

The production approach recognizes that a bank is a producer of a range of financial services. These services are to deposit holders and borrowers alike and include not just intermediation services but a host of other financial services that would be charged to the non-interest earning account. Under this approach the number of deposit and loan accounts plus the number of financial transaction logged over a period of time would be taken as the appropriate definition of output and the inputs will be purely labor and fixed assets (as a measure of capital in neo-classical production theory). Total costs would only cover operational costs and interest costs are excluded (Ferrier et al, 1993). The literature on bank efficiency has tended to produce results using the intermediation approach, largely because balance sheet and income account data is more readily available than what would be required for the production approach.

Most economists generally accept the principle of rational behavior and analyze banks utilizing the neo-classical theory of the firm (Adongo, Stork & Hasheela, 2005). Such approach makes possible to use traditional economic measures of efficiency (inputs, outputs, cost constraints, etc.). However, in the reality banks operate under uncertainty and imperfect information. This suggests that banks should not be

assessed on the basis of traditional efficiency measures alone, and that assessing their overall performance requires assessing both efficiency and risk factors.

In this study, the technology adoption is deemed to be one of the main determinants of efficiency. This correlates with the Neo-Classical Theory which stipulates that a bank may be technically inefficient for technical reasons such as low training or low human capital levels of managers and workers, or the use of inferior or out-of-date technology.

2.2.3 Modern Portfolio Theory

Any firm should have a portfolio of investments in different types of investment to maximize returns and minimize risks. It is standard practice for banks to invest in a diversified portfolio to minimize risk and harness the returns of the various investment options on offer (Cumming, 2009). The modern portfolio theory (MPT) is a theory of finance that attempts to maximize expected portfolio returns for a given amount of portfolio risk, or equivalently minimize risk for a given level of return by carefully choosing the proportions of various assets. MPT models a portfolio as a weighted combination of assets, so that the return of a portfolio is the weighted combination of the assets return.

The process of selecting a portfolio may be divided into two stages. The first stage starts with observation and experience and ends with beliefs about the future performances of available securities. The second stage starts with the relevant beliefs about future performances and ends with the choice of portfolio. One type of rule concerning choice of portfolio is that the investor does (or should) maximize the discounted (or capitalized) value of future returns. Since the future is not known with certainty, it must be "expected" or "anticipated" returns which are discounted.

Through combining different assets whose returns are not perfectly positively correlated, MPT seeks to reduce the total variance of the portfolio return. MPT also assumes that investors are rational and the markets are efficient (Markowitz, 1952). This theory will be applied to determine the relationship between investment on technology by banks and the outcome of the investment or risk as stated in the theory.

2.3 Determinants of Operational Efficiency

Operational efficiency is indicated by service quality. Service quality differs from material goods quality. Bateson and Hoffman (2009) defined services as deeds, efforts or performance whilst Regan (1963) saw services as activities, benefits or satisfactions offered for sale or provided in connection with the sale of goods. E-service is deeds, efforts or performances whose delivery is mediated by information technology (including the Web, information kiosks and mobile devices). Such e-service includes the service element of e-retailing, customer support and service, and service delivery (Zhang & Prybutok, 2005).

Quality is differentiable and stem from the expectations of customers. Hence, it is necessary to identify and prioritize expectations for service and incorporate these expectations into a process for improving service quality (Kassim & Bojei, 2001). Implementing and evaluating service quality is a very complex process. Two aspects need to be taken into consideration when evaluating service quality: content and delivery (Zeithaml & Bitner, 2009). Customers may be in the best position to evaluate the quality of delivery, while the service providers are the best judges of the content of the message. Though there are a number of different aspects of services involved, this study focuses on only one: the perceptions of clients as to the quality of the services rendered by Post Bank. Similar to service quality, customer satisfaction can

occur at multiple levels of an organization for example with the contact person, satisfaction with the core service and satisfaction with the organization as a whole. Service quality is a concept that has aroused considerable interest in the research literature because of the difficulties in both the defining it and measuring it with no overall consensus emerging on either (Wisniewski, 2001).

As services are produced and consumed simultaneously, customers are present and may take part in the delivery process. They may, therefore, affect or shape the performance and quality of the service, in some cases causing disruption and increased waiting time and consequently lower customer satisfaction (Zeithaml & Bitner, 2009). Vandermerwe (1993) suggests that connections between the employee and customer can be made through physical, psychological or electronic means, but some sort of interactivity must be present if a quality service that sustains long term customer satisfaction is to be the result. Service quality has been recognized as having the potential to deliver strategic benefits, such as improved customer retention rates, whilst also enhancing operational efficiency and profitability (Cronin, 2003). Oliveira et al (2002) suggest that e-service quality is amongst a firm's competitive capabilities that lead to business performance, Roth and Menor (2003) see issues in implementing service technology and eservices as critical in service operations, and Al- Hawari and Ward (2006) demonstrates that service quality impacts on customer satisfaction which in turn affects the financial performance and operational efficiency of banks.

Internet banking is a way to reduce costs and increase profits. It also increased the convenience for customers. It is a result of the competition between banks that try to find innovative services to increase their profits (Arnaboldi & Claeys 2008). As banking technology has focused on reducing cost of distribution, internet banking is

characterized as process innovations by making customers handle their own banking without going to bank tellers (Chang, 2003).

There are two ways that banks can offer internet banking. The first one is an existing bank that has physical offices that offer internet banking as an addition service to the traditional ones. The second way is for the banks where no branches exist (Furst, Lang & Nolle, 2012). Internet banking has got several advantages, of which the clear one is that customers do not have to wait a lot of time to request a transaction. They can also do it any time not only during the banking hours. The banks also provide some incentives for those who make use of these services such as the clients will get a discount if they apply for a credit card online.

Through the internet banking, one can transfer funds from an account to other, apply for cards such as credit card or VISA and can also check the balance on the accounts and have an overview of the transactions made. Other services that are available include paying the bills, ordering cheque book, opening new accounts and sending messages to the bank. Since the customers do not need to visit the branches for these services, this will reduce the number of cashiers or clerks. Also, it is cost-effective since a lot of customers are dealt with at once. The main advantage of internet banking is that it is available any time of the day so the consumers can get access of their accounts at what time they prefer without having to wait in the queues to do the transaction. Even if the consumers are abroad, one can still get hold of the bank account. Although these advantages are of a benefit for the customers there are still some who prefer to do banking in the traditional way (Zhang & Prybutok, 2005).

The main disadvantage that discourages them is the fact that there will be no human contact to deal with. Also, some have doubts if the transaction made online will be

successful. Some other advantages and disadvantages include internet banking serves as a one-stop shop. This is since internet banking offers several services such as paying the bills, transferring funds from an account to the other and opening an account. Another advantage mentioned is that banks provide security to protect the customer. However, this issue of security is also listed as one the disadvantages since there are people who do not use internet banking because they do not feel safe. Another disadvantage mentioned is that internet banking is very impersonal. There will be no one to check that the information entered is correctly since one is only dealing with the internet. Some other advantages of internet banking has can be related to security. Therefore, banks need to take important measures when dealing with technology in banking. High measures of security need to be taken since there will be a lot of personal data and confidentiality has to be maintained. The information has to be accurate; therefore the system has to be continually upgraded and monitored. Standardization across hardware and software are essential to make possible inter-connectivity of systems across branches (Leeladhar, 2005).

Generally, automated teller machines are operated by customers for withdrawing currency from and depositing currency and other negotiable documents into various customer accounts. In general, the ATM has three stages during its operation. The ATM reads magnetically the data of the card inserted that will then verifies the personal identification number of the particular customer and the amount of the requested withdrawal or deposit (Lysons, 2006). Then, the ATM determines the customer's bank account and the balance through an access of a central computer finally, the machine either accepts or dispenses cash ATM is one of the rapid types of technology in banking that is continually growing. This is particularly so popular since one can make transactions 24 hours a day.

Credit cards are means of payment by electronic data. A credit card is a plastic card with a magnetic strip that allows customers to make banking transactions. They are convenient since there is no need to carry large amounts of cash and they can also be used in cases of emergency, when the customer spends more than one has budgeted. These cards are used at the local ATMs free of charge and are used to make purchases person, over the phone, or online. Some credit cards are accepted internationally such as VISA and Master card. Therefore they can be used in international ATMs (Zhang & Prybutok, 2005).

Mobile services are one of the latest services that the banks offer. Through this service, the customers will receive messages on the mobile phone when transactions that involve the customers such as those relating to the accounts or the cards occur. This will reduce the risk that the account or the cards are being used by another person and not the customer. Also, the customers can top up their mobile phone by sending an SMS that will automatically reduce the amount from the customer's account Mobile services are one of the latest services that the banks offer (Mallat, Rossi & Tuunainen, 2004).

2.4 Empirical Studies

Khaled (2013) on a study on the Impact of Information and Communication Technology on the performance of Libyan banks found out that, the utilization of a new technology became widespread in both developed and developing economies especially in the banking sector in the recent years. However Libya was still using traditional methods in commercial banking systems. The results of the study confirmed the level of using ICT was low in Libyan commercial banks; in addition an analysis revealed that poor state infrastructure, especially within the fields of

telecommunications and electricity, causes unattractive performance within Libyan commercial banking operation and government intervention was the main reason behind the lack implementation of ICT.

Niwamanya (2012) did a study on technology and operational efficiency of commercial banks in Kampala. The study found out that the use of new technologies had provided numerous advantages to the operations of the banks, for example, it had improved on the management of queues and extended the service or working hours for the banks. The study also indicated that the non- credit income of Post Bank had increased significantly, profitability levels had improved too, and the execution of tasks by the staff of the banks was done with utmost accuracy and precision, hence improving on the operational efficiency of the banks. A high positive relationship was obtained between the use of new technologies and operational efficiency which implied that the adoption of the new technologies had streamlined service delivery by the banks. The study concluded that adoption of the new technologies had greatly boosted the operational efficiency of banks and enabled them to perform at a competitive level with other banks.

Mahdi and Mehrdad (2010) used chi-square to determine the impact of e-banking in Iran and their findings from the viewpoints of customers is that, e-banking cause higher advantages to Iranians. In other words, Iran banks provide services that the customers are deriving satisfaction with particular reference to the use of e-banking.

Agboola (2006) investigated electronic payment systems and telebanking services in Nigeria. The findings revealed that there has been a very modest move away from cash. Payments are now being automated and absolute volumes of cash transactions have declined. The result of the study revealed that tele-banking is capable of

broadening the customer relationship, retain customer's loyalty and enable banks to gain commanding height of market share if their attendant problems such as, ineffectiveness of telecommunications services, epileptic supply of power, high cost, fear of fraudulent practices and lack of facilities necessary for their operation were taken care of.

Rogers (2005) identified five characteristics or attributes of innovations that affect the rate at which innovations are adopted (and ultimately their usage patterns): their relative advantage, compatibility, complexity, divisibility (trialability), and communicability (observability). Additional characteristics were later added; perceived risk (Ostlund, 2005) and financial and social cost (Zeithaml, 2005). In the categorization of services in technology-based service delivery options, Dabholkar (1994) suggested there are a number of relevant classifications that will apply to industries employing technology based service delivery. The classification analyses the deliverer of the service. That is, person to person, where the employee uses the technology or consumer to technology, such as the use of an ATM. The next categorization looks at where the service is delivered. Either on the service firm's sites themselves, at the customer's home or office or at a neutral site such as an ATM located at an airport. The final categorization looks at the contact the customer has with the service operation, either direct or indirect such as in the case of telephone banking. Dabholkar (1994) stipulates that there should be flexibility in the design of the technology to allow customers to make changes during the transaction and make available a customer service adviser if required, with minimum waiting. In most cases the transaction occurs in a neutral location and the availability of an employee may not always be feasible since these facilities often operate 24 hours a day, seven days a week. This study investigated whether Post bank had installed ATMs with many

menu options and multiple languages for purposes of easing service delivery to the clients.

Berger (2003) on a study to determine the technological progress and its effects in the banking industry found out that, banks are intensive users of both IT and financial technologies, and have a wealth of data available that may be helpful for the general understanding of the effects of technological change. The research suggests improvements in costs and lending capacity due to improvements in “back-office” technologies, as well as consumer benefits from improved “front-office” technologies. The research also suggests significant overall productivity increases in terms of improved quality and variety of banking services. In addition, the research indicates that technological progress likely helped facilitate consolidation of the industry.

Karjaluoto et al (2002) indicated that banks have the choice to offer their banking services through various electronic distribution channels technologies such as Internet technology, video banking technology, telephone banking technology, and Wireless Application Protocol (WAP) technology. They also indicated that Internet technology is the main electronic distribution channel in the banking industry. In other words, e-banking as an online banking that involves the provision of banking services such as accessing accounts, transferring funds between accounts, and offering an online financial service.

Carrington et al (2002) found out that new technologies are predicted to transform and revolutionize traditional banking industry. Banking services are easily digitalized and automated and, thus, from an operational perspective, lend themselves to the internet (Daniel, 1998) the potential competitive advantage of the internet for banks lies in the areas of cost reduction and satisfaction of consumer needs. According to Siau et al

(2001) m-commerce (mobile commerce) that includes WAP has some features of mobile business include; Ubiquity. Mobile technology enables the user to access information wherever they are assuming the user is within the cellular broadcast area, personalization. Due to the limited memory capacity of the mobile hardware, software enables a finer degree of sorting and categorization to meet the mobile users' needs, flexibility. The mobility of the hardware, e.g. cellular handsets permits the user to conduct transactions and/ or receive information even when the user is engaged in another activity such as traveling or working, dissemination. Originators of information, for example local retailers, may use the wireless network of m-commerce to deliver specific information to some or all WAP users that come into the geographic region.

Jayawardhena and Foley (2012) explore e-banking as a new delivery channel arguing that e-banking may help to overcome the inherent disadvantages of traditional banks; it is very clear that if e-banking conducted successfully it leads to big volume of transactions. Further, Birch and Young (1997) argue that the internet may be exploited as a new delivery channel by the financial services industry to completely reorganize the structure of banks. It means that conducting e-banking in Iran leads more usage of ATM in Iran. The authors came to conclusion that the active ATM in banking sectors will cause cash circulation decreases, the efficiency of banking sector will increase, as: a) client banking costs decreases (less cash fees to pay), b) shop keeper / service provider costs will decrease, and c) bank costs decrease (cash storage, less checking and processing costs), costumers have not enough knowledge related to e-banking in Iran. Accordingly the null hypothesis is rejected also. The authors believe that the lack of enough information on e-banking in Iran may cause less

efficiency of Iranian banks. The findings left a contextual gap that was bridged using the findings from Post Bank Uganda Ltd.

Woherem (2012) claimed that only banks that overhaul the whole of their payment and delivery systems and apply ICT to their operations are likely to survive and prosper in the new millennium. He advises banks to re-examine their service and delivery systems in order to properly position them within the framework of the dictates of the dynamism of information and communication technology.

Njuguna (2012) on a study on internet banking adoption in Kenya posits that, the adoption of Internet banking as a platform for carrying out banking services has continued to rise globally. This can be attributed to a number of factors such as perceived usefulness, perceived ease of use, self-efficacy, relative advantage, compatibility, and result demonstrability. The purpose of the study was to establish the factors that influence adoption of internet banking among the individuals who have accounts with commercial banks in Nairobi County, Kenya. This study used two commonly applied and empirically supported models of information technology adoption to achieve this objective. In this study, technology acceptance model (TAM) is extended by two external variables, namely risk and self-efficacy. The second model used was a reduced version of perceived characteristics of innovation (PCI) model, without the image and voluntariness constructs. A survey was carried out on 300 individuals in Nairobi, Kenya. The findings indicated that internet banking use in Kenya is very low. Further, results indicated that users' perceptions of various aspects of internet banking are more positive than non-users' perceptions, except for risk.

Oluoch (2012) on study on factors affecting adoption of mobile banking technology in Kenya posits that, although the financial system is very important to economic

development of a country, many Kenyans lack access to formal financial services. This is because putting up bank branches in the remote areas of the country is not economically viable. To help alleviate this problem, majority of banks in Kenya have now implemented Mobile banking (M - banking) technology in order to provide convenient and affordable banking services. However, this effort may not bring much result if the factors affecting adoption of M-banking technology have not been established. The study focused on determining the effect of important factors affecting adoption of M-banking technology in Kenya by extending the renowned framework of Technology Acceptance Model (TAM), a case of Nakuru Municipality. The study found that PU and PEOU positively affect Mobile banking adoption. However, PR was found to have a negative effect on Mobile banking adoption. The findings were consistent with similar studies carried out in other countries including South Africa and Malaysia. These findings show that mobile banking is useful to bank customers. However, they have concerns about security in using mobile banking which should be addressed by stakeholders in the banking industry.

Aduda and Kingoo (2012) conducted a study on the Relationship between Electronic Banking and Financial Performance among Commercial Banks in Kenya. Banking industry has been in a process of significant transformation. The force behind this transformation of the banking industry is innovation in information technologies. Information and communication technology is at the centre of this global change curve of electronic banking system in Kenya today. It is against this background, this study investigated the relationship between e-banking and performance of Kenya banking system. Specifically, the study established whether there is relationship between the dependent variable i.e., performance measured by return on assets and the independent variables: investments in e-banking, number of ATMS and number of

debits cards issued to customers as proxy for e-banking. The study used secondary data. The data was collected from annual report of target banks and Central Bank of Kenya. The study used both descriptive and inferential statistics in analyzing the data. In general the study revealed that e-banking has strong and significance marginal effects on returns on asset in the Kenyan banking industry. Thus, there exists positive relationship between e-banking and bank performance. In general conclusion the electronic banking has made banking transaction to be easier by bringing services closer to its customers hence improving banking industry performance.

Mwai (2013) did effect of the proliferation of electronic banking on the financial performance of commercial banks in Kenya. With liberalization and internalization in the financial market and progress in information technology, banks face competitive pressure to provide quality service for improved financial performance. Although one of the primary motivations among commercial banks for adopting electronic banking is the possibility of increasing profitability by lowering the cost of providing retail banking services and attracting new technology savvy customers, most studies have failed to establish the relationship between electronic banking and banks performance. While some researches find positive relationship between electronic banking adoption and financial performance; to others the relationship is negative. This study, therefore, sought to find out the effect of electronic banking on the financial performance of commercial banks in Kenya. The study looked at how transactional convenience, efficiency and service accessibility brought about by electronic banking influence the annual net profits of commercial banks. This study took on a causal-comparative research design on a target population of middle management staff from all the commercial banks in Kenya which were 45 in number by the end of 2010. The study sampled one respondent from the targeted banks on

whom semi-structured questionnaires were sent as the main research instrument. Besides the questionnaires, the study also used secondary source materials such as the annual financial statements. The data was collected and run through SPSS from which descriptive statistics (frequencies, mean and standard deviation) were drawn. The study used multiple linear regression analysis to show the relationship between independent and dependent variables. The study established a very good linear dependence between banks' financial performance and electronic banking; that is, service accessibility, transactional convenience and service efficiency brought about by electronic banking increases banks' financial performance. The study concluded that electronic banking has revolutionized the way transactions are carried out from depositing of money to withdrawals and checking of balances. The customers do not have to go to the actual physical location of the banks. This is also made more convenient since it can be done anywhere. The transactions that are conducted are very accurate thus it is not a major security risk either losing money or any form theft. Some of the quality services that customers get in the banks cannot be accessed through electronic banking such as making changes in their transactions. The study recommends that the banking industry in Kenya should be open to emulate new innovation that will improve their finance management; the government should invest in education of IT personnel and the society should be molded to emulate new technology

Asiabugwa and Munyoki (2013) aimed at establishing the relationship between e-commerce strategy and performance of commercial banks in Kenya. The study also sought to establish the factors influencing the adoption of e-commerce strategy in commercial banks in Kenya. The results of the research have been conducted and interpreted with a view of developing a better understanding of the relationship of

ecommerce strategy on performance of commercial banks in Kenya. The study adopted a cross sectional design, and targeted commercial banks in Kenya under the umbrella of Kenya Institute of Bankers Association (KIB). Data analysis was through percentage, frequency, mean, standard deviation, and correlation analysis. The results indicated that there was a strong relationship between the e-commerce strategy and performance of commercial banks in Kenya. The banks that have adopted e-commerce strategy were more efficient and more relevant to meeting the needs of the modern customers. The findings also indicated that the main factors which influenced the adoption of the e-commerce strategy in banks to a larger extent are customer support service and the payment systems.

Bichanga and Ali (2014) did a study highlights the effects of E-banking services on growth of customer base in Kenyan banks for over the last 5 years and what factors hindered the effective utilization of E-banking service in Kenyan banks and its impact on growth of customer base. This study addressed issues that affected effective utilization of E-banking facilities by customers. The study used three key variables in investigating the problem and those variables include: card system, automated teller machine (ATM) and electronic fund transfer. The study generally investigated how lack of technological know-how, illiteracy, unreliability, and transaction limits has hindered growth of on-line customer base in Kenyan banks. E-banking provides enormous benefits to consumers in terms of time saving and cost of transactions, either through internet, telephone or other electronic delivery channels. For many consumers, electronic banking means 24-hours access to cash through an Automated Teller Machine (ATM) or Direct Deposit of paychecks into checking or savings accounts. But electronic banking now involves many different types of transactions. E-banking is a form of banking where funds are transferred through an exchange of

electronic signals between financial institution, rather than exchange of cash, cheque or other negotiable instruments. The research adopted a descriptive research design, a survey of selected Kenyan banks. The study used stratified random sample to ensure equal representation where 135 respondents were selected from the strata/ banks. According to the results obtained in the study e-banking has enhanced the growth of the customer base for the banking institutions in Kenya, through enhancing banking services accessibility to a larger population in the country. Therefore the study recommended the banks should embrace e-banking as a key competitive advantage.

2.5 Summary of Literature Review

The concept of operational efficiency derives its basis in the neo-classical theory of the firm and assumes profit maximizing behavior. Efficiency, as a key factor of competitiveness, nowadays receives a multidimensional interest justified by the coexistence of well-defined capacities and skills making up a neither entangled and inter-related set which we cannot minimize nor neglect the value of one over the other.

The chapter reviewed literature on the relationship between the adoption of technology and operational efficiency of commercial banks. The literature indicates that there are conflicting views offered by different studies and there is less on Kenyan perspective. Most of these studies are done in other countries whose strategic approach and financial footing is different from that of Kenya. Most of them also focus on both the microeconomic and macroeconomic variables. There is therefore a literature gap on the relationship between microeconomic variables and operational efficiency of commercial banks in developing countries. This study therefore seeks to fill this gap by focusing on the relationship between microeconomic variables and operational efficiency of commercial banks in Kenya.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter includes the various stages that were followed to complete the study. It gives the methodology for data collection, measurement and analysis. The chapter therefore comprised of the following subsections: research design, target population, data collection procedures and data analysis.

3.2 Research Design

Orodho (2003) defined a research design as the scheme, outline or plan that was used to generate answers to research problems. This study adopted the descriptive research design based on the key areas of interest. Descriptive research design helped the researcher to clearly identify and describe true characteristics of a research problem without manipulation of research variables (Mugenda & Mugenda, 2003). Orodho (2003) and Kothari (2004) describe a descriptive survey design as a design that seeks to portray accurately the characteristics of a particular individual, situation or a group. According to Polit and Beck (2003), in a descriptive study, researchers observe, count, delineate, and classify. They further describe descriptive research studies as studies that have, as their main objective, the accurate portrayal of the characteristics of persons, situations, or groups, and/or the frequency with which certain phenomena occur. Previous studies related to technology adoption in banks (Olweny & Shiphoo 2011; Aduda & Kingoo, 2012) have used this design.

3.3 Target Population

Accordingly Ngechu (2004), a study population is a well-defined or specified set of people, group of things, households, firms, services, elements or events which are being investigated. Target population is the specific population about which information is desired (Ngechu, 2004). The population of interest in this study comprised of the 43 commercial banks operating in Kenya as at December 2013. The study took a census approach since the population was not big.

3.4 Data Collection

In this study emphasis was given to secondary data which was obtained from the financial results filled at Central Bank of Kenya and Annual Banking Survey reports. The data included the actual financial statements data covering the period between 2009 and 2013.

3.5 Data Analysis and Presentation

The study used both descriptive and inferential statistics in analyzing the data. Analysis was done with the help of Statistical package for social sciences (SPSS version 21). First, data collected was cleaned, sorted and collated. Then, data was entered into the computer, after which analysis was done. Descriptive statistics such mean score, frequencies and percentages for each variable was calculated and tabulated using frequency distribution tables and graphs. In order to test the relationship between the variables the inferential tests including the regression

analysis was used. Regression analysis was therefore used to determine the relationship between variables in the study. The regression equation was:

$$OE = \beta_0 + \beta_1 \text{ATMs} + \beta_2 \text{IB} + \beta_3 \text{MB} + \beta_4 \text{EFTPOS} + e$$

Where,

OE is Operational Efficiency (cost to income ratio).

β_0 is a Constant.

$\beta_1, \beta_2, \beta_3$ and β_4 are Coefficients of determinations

ATMs is the variable depicting the natural log of value transacted through ATMs.

IB is the variable depicting the natural log of value transacted through Internet Banking .

MB is the variable depicting the natural log of value transacted through mobile banking.

EFT POS is the variable depicting the natural log of value transacted through debit and credit cards

“e” is the stochastic disturbance error term.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the information processed from the data collected during the study on the relationship between technology adoption and operational efficiency among commercial banks in Kenya. The sample composed of 43 commercial banks operating in Kenya as at December 2013.

4.2 Descriptive statistics

Table 4.1: Summary of the study variables for the study period

	2009	2010	2011	2012	2013	Mean	Standard Deviation
ATM Cards	4,291,6 61,581	3,705,8 16,279	3,969,8 32,674	4,829,7 34,000	5,115,5 35,372	4,382,5 15,981	586,047,33 2.7
Debit and Credit Cards	2,701,6 07,672	1,950,3 20,999	2,073,1 75,496	2,458,7 17,989	2,710,2 47,190	2,378,8 13,869	352,650,50 2.9
Internet banking	1.6792 7E+14	1.2360 3E+14	1.3026 2E+14	1.4979 3E+14	1.7536 7E+14	1.4939 E+14	2.26353E+ 13
Mobile banking	3,841,6 86,442	3,221,5 80,791	3,979,7 56,349	4,829,6 42,698	6,472,0 49,977	446,89 43,251	125809465 9
Operational Efficiency	0.2298 6	0.2120 4	0.2187 7	0.2385 0	0.2968 9	0.2392	0.03381

Table 4.1 shows the trend of the various variables of the study for the study period. The findings depict that the amount transacted through ATM cards had slight changes over the study period with 2013 having the highest amount transacted (5,115,535,372). The amount transacted through debit cards recorded slight increments although there was a decline in 2010 where only 1,950,320,999 was transacted. The value transacted through internet banking increased steadily although there was a drop in 2010 which had the lowest value at 1.23603E+14, the same trend was recorded by mobile banking values where 2010 had the lowest value at 3,221,580,791. The operational efficiency also increased over the years but just as internet banking and mobile banking 2010 recorded the lowest value at 0.21204.

4.3 Regression Results

The study conducted a cross-sectional multiple regression on several technology adoption variables over the period 2009 - 2013 and of operational efficiency. Coefficient of determination explains the extent to which changes in the dependent variable can be explained by the change in the independent variables or the percentage of variation in the dependent variable (operational efficiency) that is explained by all the four independent variables (ATM cards, debit and credit cards, internet banking and mobile banking).

Table 4.2: Results of multiple regression between operational efficiency and the combined effect of the selected predictors

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.843	0.710649	0.705	0.512

Source: Author (2014)

The four independent variables that were studied, explain 70.5% of the operational efficiency as represented by the adjusted R^2 . This therefore means the four variables contribute to 70.5% of operational efficiency, while other factors not studied in this research contributes 29.5% of operational efficiency among commercial banks in Kenya. Therefore, further research should be conducted to investigate the other (29.5%) factors influencing operational efficiency among commercial banks in Kenya.

Table 4.3: Summary of One-Way ANOVA results of the regression analysis between earnings management and predictor variables

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.601	4	1.182	4.203	0.0174
	Residual	17.26	38	0.306		
	Total	20.861	42			

Source: Author (2014)

From the ANOVA statistics in table 4.3, the processed data, which are the population parameters, had a significance level of 0.0174 which shows that the data is ideal for making a conclusion on the population's parameter. The F calculated at 5% Level of significance was 4.203. Since F calculated is greater than the F critical (value = 2.62), this shows that the overall model was significant i.e. there is a significant relationship between operational efficiency and technology adoption.

Table 4.4: Regression coefficients of the relationship between operational efficiency and the four predictive variables

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.514	0.108		2.019	0.035
	ATM Cards	0.724	0.114	0.581	3.593	0.021
	Debit and Credit Cards	0.368	0.146	0.305	-3.556	0.036
	Internet banking	0.405	0.137	0.249	4.874	0.015
	Mobile banking	0.529	0.103	0.343	3.825	0.034
Dependent variable: Operational efficiency						

Source: Author (2014)

The coefficient of regression in table 4.4 above was used in coming up with the model below:

$$OE = 0.514 + 0.724ATM + 0.368 EFT POS + 0.405IB + 0.529MB$$

Where OE is operational efficiency, ATM is value transacted through ATMs, EFT POS is value transacted through debit and credit cards, IB is value transacted through internet banking and MB is value transacted through mobile banking. From

the model, taking all factors (ATM cards, debit and credit cards, internet banking and mobile banking) constant at zero, operational efficiency was 0.514. The data findings analyzed also shows that taking all other independent variables at zero, a unit increase in ATM cards will lead to a 0.724 increase in operational efficiency; unit increase in debit and credit cards will lead to a 0.368 increase in operational efficiency; a unit increase in internet banking will lead to a 0.405 increase in operational efficiency while a unit increase in mobile banking will lead to a 0.529 increase in operational efficiency. According to the model, all the variables were significant as their significance value was less than 0.05. All the variables were positively correlated with operational efficiency.

4.4 Summary and Interpretation of Findings

From the above regression model, the study found out that there were technology adoption variables influencing the operational efficiency of commercial banks in Kenya, which are ATM cards, debit and credit cards, internet banking and mobile banking. They all influenced it positively. The study found out that the intercept was 0.514 for all years.

The four independent variables that were studied (ATM cards, debit and credit cards, internet banking and mobile banking) explain a substantial ATM cards, debit and credit cards, internet banking and mobile banking 70.5% of operational efficiency among commercial banks in Kenya as represented by adjusted R^2 (0.705). This therefore means that the four independent variables contributes 70.5% of the operational efficiency of commercial banks in Kenya while other factors and random variations not studied in this research contributes a measly 29.5% of the operational efficiency of commercial banks in Kenya.

The study established that the coefficient for ATM cards was 0.724, meaning that ATM cards positively and significantly influenced the operational efficiency of commercial banks in Kenya. This correlates Irechukwu (2000) who listed some banking services that have been revolutionized through the use of ICT as including account opening, customer account monitoring and transaction processing and recording. He adds that ICT has provided self-service facilities from where customers can validate their account numbers and receive instructions on when and how to receive their credit and debit cards and cheque books.

In addition, Litan (1999) described the introduction and rapid use of ATM as the most visible revolutions in banking sector. He also supported his claim by stating that ATMs offer consumers the convenience of banking in many more locations than ever before and are cheap to operate than a bank branch. Today nearly 200,000, ATMs are found throughout the country, more that collective number of bank branches and credit unions.

The study also established that the coefficient for debit and credit cards was 0.368, meaning that debit and credit cards positively but significantly influenced the operational efficiency of commercial banks in Kenya. This is in line Rainer (2003) Technologies such as ATMs, credit cards, debit cards, mobile phones and points-of-sale (POS) have been used to reduce costs and make clientele profitable to banks. There is a tremendous opportunity for banking technology to connect to clients at reduced costs and bring millions of consumers to the formal financial marketplace through electronic channels. The application of new technologies has been proven as an effective way to reduce the costs of operation for the financial institutions.

The study further revealed that the coefficient for internet banking was 0.405 meaning that internet banking positively and significantly influences the operational efficiency of commercial banks in Kenya. This correlates with Dabholkar (2009) internet banking allows customers to perform tasks at a time and in a place convenient to them. Direct contact with such technology also gives customers a feeling of greater control. Smith (1987) is of the opinion that technology was introduced in banks originally to reduce costs but that, by dividing front and back office operations, technology can be targeted to enhance different functions.

The coefficient for mobile banking was 0.529, this shows that mobile banking significantly and positively influences the operational efficiency of commercial banks in Kenya. This is in line with Mallat, Rossi and Tuunainen (2004) who states that mobile services are one of the latest services that the banks offer. Through this service, the customers receive messages on the mobile phone when transactions that involve the customers such as those relating to the accounts or the cards occur. This reduces the risk that the account or the cards are being used by another person and not the customer. Also, the customers can top up their mobile phone by sending an SMS that automatically reduce the amount from the customer's account Mobile services are one of the latest services that the banks offer.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

Banks, like other service organizations, strive to improve customer service level and tie their customers closer. Technology is one leading driving force nowadays, in different businesses. Technology has become an intrinsic part of banking, making it easier and cheaper to develop and deliver financial services. As a consequence of the highly technological environment developed around the world in the banking industry, the expansion of distribution channels for financial services relies on a very complex network of partnerships. With competition in the banking sector becoming intense and new financial service providers emerging all the time, this could result into the banks inability to function effectively and efficiently. The purpose of the study was to establish the effect of technology adoption on operational efficiency among commercial banks in Kenya. This study adopted the descriptive research design based on the key areas of interest. The population of interest in this study comprised of the 43 commercial banks operating in Kenya as at December 2013. The study took a census approach since the population was not big. In this study emphasis was given to secondary data which was obtained from the financial results filled at Central Bank of Kenya and Annual Banking Survey reports. The data included the actual financial statements data covering the period between 2009 and 2013. The study used both descriptive and inferential statistics in analyzing the data. Analysis was done with the help of Statistical package for social sciences (SPSS version 21). Descriptive statistics such mean score, frequencies and percentages for each variable was calculated and tabulated using frequency distribution tables and graphs. In order

to test the relationship between the variables the inferential tests including the regression analysis was used. Regression analysis was therefore used to determine the relationship between variables in the study. From the regression model, the study found out that there were technology adoption variables influencing the operational efficiency of commercial banks in Kenya, which are ATM cards, debit and credit cards, internet banking and mobile banking. They all influenced it positively. The study found out that the intercept was 0.514 for all years. The four independent variables that were studied (ATM cards, debit and credit cards, internet banking and mobile banking) explain a substantial ATM cards, debit and credit cards, internet banking and mobile banking 70.5% of operational efficiency among commercial banks in Kenya as represented by adjusted R^2 (0.705). The study established that the coefficient for ATM cards was 0.724, meaning that ATM cards positively and significantly influenced the operational efficiency of commercial banks in Kenya. The study also established that the coefficient for debit and credit cards was 0.368, meaning that debit and credit cards positively but significantly influenced the operational efficiency of commercial banks in Kenya. The study further revealed that the coefficient for internet banking was 0.405 meaning that internet banking positively and significantly influences the operational efficiency of commercial banks in Kenya. The coefficient for mobile banking was 0.529, this shows that mobile banking significantly and positively influences the operational efficiency of commercial banks in Kenya. The study therefore concludes that technology adoption positively and significantly influences operational efficiency of commercial banks in Kenya.

5.2 Conclusions

This study examined the relationship between technology adoption and operational efficiency of commercial banks in Kenya. The four independent variables that were studied (ATM cards, debit and credit cards, internet banking and mobile banking) explain a substantial 70.5% of operational efficiency among commercial banks in Kenya as represented by adjusted R^2 (0.705). This therefore means that the four independent variables contributes 70.5% of the operational efficiency of commercial banks in Kenya while other factors and random variations not studied in this research contributes a measly 29.5% of the operational efficiency of commercial banks in Kenya.

The study concludes that ATM cards positively and significantly influenced the operational efficiency of commercial banks in Kenya. This correlates Irechukwu (2000) who listed some banking services that have been revolutionized through the use of ICT as including account opening, customer account monitoring and transaction processing and recording. He adds that ICT has provided self-service facilities from where customers can validate their account numbers and receive instructions on when and how to receive their credit and debit cards and cheque books.

The study also concludes that debit and credit cards positively but significantly influenced the operational efficiency of commercial banks in Kenya. This is in line Rainer (2003) Technologies such as ATMs, credit cards, debit cards, mobile phones and points-of-sale (POS) have been used to reduce costs and make clientele profitable to banks. There is a tremendous opportunity for banking technology to connect to clients at reduced costs and bring millions of consumers to the formal

financial marketplace through electronic channels. The application of new technologies has been proven as an effective way to reduce the costs of operation for the financial institutions.

The study further concludes that internet banking positively and significantly influences the operational efficiency of commercial banks in Kenya. This correlates with Dabholkar (2009) internet banking allows customers to perform tasks at a time and in a place convenient to them. Direct contact with such technology also gives customers a feeling of greater control. Smith (1987) is of the opinion that technology was introduced in banks originally to reduce costs but that, by dividing front and back office operations, technology can be targeted to enhance different functions.

The study finally concludes that mobile banking significantly and positively influences the operational efficiency of commercial banks in Kenya. This is in line with Mallat, Rossi and Tuunainen (2004) who states that mobile services are one of the latest services that the banks offer. Through this service, the customers receive messages on the mobile phone when transactions that involve the customers such as those relating to the accounts or the cards occur. This reduces the risk that the account or the cards are being used by another person and not the customer.

5.3 Limitations of the Study

There were challenges which were encountered during the study. Some officers who are concerned with safe custody of commercial banks in Kenya files containing audit reports were initially reluctant to release them. That reluctance delayed the completion of data collection.

There was also limited availability of local literature with respect to the relationship between technology adoption and operational efficiency of commercial banks in Kenya which was overcome by consultation of foreign literatures and reference to other relevant locally published materials.

Further, the data was tedious to collect and compute as it was in its very raw form. Due to lack of standardization of financial statements from various commercial banks in Kenya, data computation was made even harder.

In addition, time and resources allocated to this study could not allow the study to be conducted as deeply as possible in terms of other predictor variables for operational efficiency of commercial banks in Kenya.

Finally, the study had a draw back from most financial institutions which lacked proper reports that showed records of the benefits directly accrued from the adoption of technology in their operations. This posed a challenge on data collection process.

5.4 Recommendations for Policy and Practice

The following recommendations for policy were made based on the findings and conclusion of the research study.

First, the capacity to manage technologies is a key in the adoption of technology in banks Martin and Matlay,(2001).The supply of qualified people in ICT remains small, and the reason for the high labour costs. As a result many banks cannot engage full time qualified ICT personnel. This affects the extent of ICT usage in banks. There is need policy makers to develop policies that will increase the number of qualified ICT personnel, such as encouraging many institutions to start ICT related courses, and tertiary institutions working hand in hand with banks and other stakeholders to

develop an ICT banking curriculum that provide appropriate ICT banking skills relevant to the industry and meet the current and future needs of banks in Kenya.

Secondly, the Government and donors must be encouraged to support the software development activities and in particular the capacity developments of skilled labour in ICT applications, and thereafter encourage banks to adopt ICT banking application in their operations alongside the technologies that are already in use. Donors and government must promote awareness campaigns on the benefits associated with ICT banking for success of banks.

Thirdly, banks should device means of using technology in improving service quality. In an environment where competition for customers and retention of existing customers is high, banks should exploit every possible opportunity to differentiate their services and products. ICT provide this opportunity and banks should employ innovative ways to make their customer experience better and attract new customers.

Finally, Commercial banks can get maximum benefit by investing in technology and putting in a better ICT banking solutions that work for them.

5.5 Suggestions for Further Studies

Further research is necessary as the findings were based on relative commercial banks only, and that, may have influenced the nature of results that were obtained. There is need to carry out similar research in microfinance banks and other financial institutions.

Further research focusing on the inferential analysis is necessary to study the ICT usage in banks with a focus on age, size and location of banks, ICT banking adoption

in banks and appropriate technologies and ICT solutions that are feasible for banks to meet the dual objectives of sustainability and outreach in Kenya.

Another study should also be conducted on other factors inherent in the banks and also present in the external operating environment that affect the cost efficiency of the commercial banks in Kenya.

Finally, another research should be done to establish the effect of the information and communication technology adoption on credit and risk management of commercial banks in Kenya.

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APPENDICES

Appendix I: List of Commercial Banks in Kenya

1. African Banking Corporation Limited	2. Co-operative Bank of Kenya Ltd.
3. Bank of Africa (K) Ltd.	4. Credit Bank Ltd.
5. Bank of India	6. Charterhouse Bank Ltd.
7. Citibank N.A. Kenya	8. Chase Bank (K) Ltd.
9. Habib Bank A.G. Zurich	10. Dubai Bank Kenya Ltd
11. Habib Bank Ltd.	12. Equatorial Commercial Bank Ltd.
13. Bank of Baroda (K) Ltd.	14. Equity Bank Ltd.
15. Barclays Bank of Kenya Ltd.	16. Family Bank Ltd.
17. Diamond Trust Bank Kenya Ltd.	18. Fidelity Commercial Bank Ltd.
19. K-Rep Bank Ltd.	20. Fina Bank Ltd.
21. Standard Chartered Bank (K) Ltd.	22. Giro Commercial Bank Ltd.
23. Ecobank Ltd	24. Guardian Bank Ltd.
25. Gulf Africa Bank (K) Ltd	26. Imperial Bank Ltd.
27. First Community Bank	28. Middle East Bank (K) Ltd.
29. Consolidated Bank of Kenya Ltd.	30. NIC Bank Ltd.
31. Development Bank of Kenya Ltd.	32. Oriental Commercial Bank Ltd.
33. Kenya Commercial Bank Ltd.	34. Paramount Universal Bank Ltd.
35. National Bank of Kenya Ltd.	36. Prime Bank Ltd.
37. CFC Stanbic Bank Ltd.	38. Southern Credit Banking Corporation Ltd.
39. African Banking Corporation Ltd.	40. Trans-National Bank Ltd.
41. City Finance Bank Ltd.	42. Victoria Commercial Bank Ltd.
43. Commercial Bank of Africa Ltd.	

Source: CBK, 2010, <http://www.centralbank.go.ke>

Appendix II: Raw Data

2009

	ATM Cards	CR Cards	DR Cards	e banking	Mobile banking	Operationa l Efficiency
Kenya Comme rcial Bank	70,082,74 0,000	5,560,123 ,400	29,657,312 ,500	2,468,971,265, 625,000	3,653,681, 000	0.2690
Equity Bank	20,503,21 0,000	1,778,516 ,940	2,484,960, 000	206,872,920,0 00,000	9,288,169, 000	0.2420
Barclay s Bank	4,352,211, 500	5,683,714 ,070	3,289,720, 000	273,869,190,0 00,000	23,180,89 3,000	0.3920
Cooper ative Bank of Kenya	2,734,641, 000	641,727,5 10	1,244,340, 000	103,591,305,0 00,000	9,574,081, 000	0.2390
Standar d Charter ed Bank	5,033,392, 000	40,672,46 0	552,420,00 0	45,988,965,00 0,000	1,514,756, 000	0.4130
CFC Stanbic Bank	10,927,14 3,500	69,982,27 0	434,658,75 0	36,185,340,93 7,500	20,883,48 9,000	0.1840

Citiban k N.A	329,420,0 00	37,292,80 0	280,782,50 0	23,375,143,12 5,000	564,604,0 00	0.3650
Diamon d Trust Bank	3,899,213, 500	30,300,40 0	3,040,015, 000	253,081,248,7 50,000	201,077,0 00	0.2450
NIC Bank	3,557,827, 000	39,914,95 0	682,465,00 0	56,815,211,25 0,000	1,306,820, 000	0.2670
Nationa l Bank of Kenya	1,373,099, 000	46,033,30 0	2,718,390, 000	226,305,967,5 00,000	2,649,740, 000	0.2890
Bank of Baroda	291,245,5 00	7,633,370	8,292,500	690,350,625,0 00	1,869,619, 000	0.3310
Prime Bank	437,255,0 00	40,672,46 0	159,650,00 0	13,290,862,50 0,000	769,652,0 00	0.1500
Chase Bank	1,301,345, 500	101,273,2 60	253,541,25 0	21,107,309,06 2,500	2,584,399, 000	0.2930
Imperia l Bank	789,015,5 00	370,072,7 70	1,085,465, 000	90,364,961,25 0,000	1,021,991, 000	0.3520
Bank of India	498,725,5	409,055,4	397,265,00	33,072,311,25	2,455,522,	0.3600

	00	00	0	0,000	000	
Finan bank	3,128,625, 500	71,788,64 0	557,922,50 0	46,447,048,12 5,000	971,451,0 00	0.0700
Consoli dated Bank of kenya	797,342,0 00	498,791,2 00	629,261,25 0	52,385,999,06 2,500	2,618,694, 000	0.1000
Africa bank Corpor ation	556,783,5 00	432,363,4 00	827,855,00 0	68,918,928,75 0,000	1,705,003, 000	0.2320
Gulf African Bank	732,277,0 00	89,211,37 0	407,998,75 0	33,965,895,93 7,500	2,972,835, 000	0.3000
Giro Comme rcial Bank	1,275,956, 500	277,598,2 80	1,100,190, 000	91,590,817,50 0,000	5,026,925, 000	0.2070
Equator ial Comme rcial Bank	180,544,0 00	30,358,67 0	103,540,00 0	8,619,705,000, 000	358,473,0 00	0.0120
Fidelity comme rcial	899,398,5 00	57,454,22 0	335,148,75 0	27,901,133,43 7,500	1,708,252, 000	0.1710

bank						
KRep bank	235,963,0 00	57,279,41 0	375,293,75 0	31,243,204,68 7,500	1,175,416, 000	0.4180
Develo pment Bank of kenya	46,910,50 0	24,531,67 0	50,452,500	4,200,170,625, 000	357,029,0 00	0.1390
Transna tional Bank	57,193,50 0	42,245,75 0	169,376,25 0	14,100,572,81 2,500	906,832,0 00	0.0980
Habib Bank A.G Zurich	592,046,0 00	45,683,68 0	427,296,25 0	35,572,412,81 2,500	2,205,349, 000	0.3120
Guardia n Bank	1,323,049, 000	176,033,6 70	278,341,25 0	23,171,909,06 2,500	3,705,665, 000	0.0530
Victori a Comme rcial bank	135,863,0 00	53,783,21 0	206,460,00 0	17,187,795,00 0,000	1,791,282, 000	0.2230
Habib Bank	105,742,0 00	40,264,57 0	142,406,25 0	11,855,320,31 2,500	338,618,0 00	0.2360
Orienta						0.0720

l Comme rcial Bank	241,013,5 00	30,999,64 0	111,018,75 0	9,242,310,937, 500	553,052,0 00	
Credit Bank	149,331,0 00	23,890,70 0	138,105,00 0	11,497,241,25 0,000	1,106,465, 000	0.1190
Paramo unt Univers al Bank	89,498,50 0	42,653,64 0	47,236,250	3,932,417,812, 500	344,394,0 00	0.1040
Middle East Bank	187,505,5 00	49,121,61 0	38,168,750	3,177,548,437, 500	407,208,0 00	0.0340
Dubai Bank Kenya	107,425,5 00	29,484,62 0	38,130,000	3,174,322,500, 000	551,247,0 00	0.0160
Bank of Africa Kenya Ltd	5,645,139, 500	5,064,245 ,700	23,311,651 ,250	1,940,694,966, 562,500	3,491,592, 000	0.3007
City Finance Bank Ltd	18,268,70 5,000	1,493,052 ,210	2,330,890, 000	194,046,592,5 00,000	7,845,252, 000	0.1585
Comme rcial	4,316,539, 00	5,222,390	3,125,536, 00	260,200,892,8	14,895,58	0.4030

Bank of Africa Ltd	500	,480	250	12,500	2,000	
Eco Bank Limited	2,366,637,000	542,901,590	1,133,631,250	94,374,801,562,500	7,621,432,000	0.3361
Southern Credit Banking Corporation Ltd	4,813,035,500	30,300,400	438,688,750	36,520,838,437,500	1,429,921,000	0.4527
United Bank of Africa Kenya Bank Limited	8,246,420,000	58,910,970	428,652,500	35,685,320,625,000	18,396,560,000	0.2759
Family Bank Ltd	236,782,000	30,883,100	159,805,000	13,303,766,250,000	457,748,000	0.2431
First Community Bank	321,639,500	27,736,520	2,942,907,500	244,997,049,375,000	188,081,000	0.1861

Ltd						
Investment & Mortgage Bank Ltd	3,373,597,500	30,883,100	592,061,250	49,289,099,062,500	543,666,000	0.2213

2010

	ATM Cards	CR Cards	DR Cards	e banking	Mobile banking	Operational Efficiency
Kenya Commercial Bank	81,468,660,000	5,925,592,840	31,995,487,500	2,663,624,334,375,000	3,982,191,000	0.2869
Equity Bank	22,325,985,500	2,076,101,830	3,081,516,250	256,536,227,812,500	10,920,250,000	0.2387
Barclays Bank	4,624,711,000	5,746,121,240	4,095,565,000	340,955,786,250,000	25,677,208,000	0.3718
Cooperative Bank of Kenya	3,617,341,000	827,492,270	1,554,262,500	129,392,353,125,000	11,075,841,000	0.2314

Standard Chartered Bank	5,493,306,000	41,954,400	682,813,750	56,844,244,687,500	2,317,259,000	0.4871
CFC Stanbic Bank	11,473,371,000	88,104,240	447,950,000	37,291,837,500,000	22,912,670,000	0.1637
Citibank N.A	407,680,000	42,245,750	244,435,000	20,349,213,750,000	1,247,977,000	0.2758
Diamond Trust Bank	400,218,000	37,292,800	3,077,563,750	256,207,182,187,500	213,712,000	0.2609
NIC Bank	4,352,211,500	42,653,640	770,776,250	64,167,122,812,500	1,632,803,000	0.2376
National Bank of Kenya	1,623,940,500	54,074,560	2,803,213,750	233,367,544,687,500	3,377,516,000	0.2730
Bank of Barod	387,341,500	7,924,720	164,803,750	13,719,912,187,500	2,253,001,000	0.2830

a						
Prime Bank	464,600,500	41,022,080	174,685,000	14,542,526,250,000	812,250,000	0.1840
Chase Bank	1,411,046,000	114,267,470	423,033,750	35,217,559,687,500	3,379,682,000	0.2600
Imperial Bank	130,448,500	508,289,210	1,209,038,750	100,652,475,937,500	1,067,116,000	0.3569
Bank of India	505,960,000	440,521,200	475,346,250	39,572,575,312,500	2,527,361,000	0.2943
Fina bank	4,049,591,000	96,378,580	590,201,250	49,134,254,062,500	1,059,535,000	0.0192
Consolidated Bank of Kenya	835,789,500	574,542,200	666,538,750	55,489,350,937,500	3,563,070,000	0.1262
Africa bank Corporation	736,736,000	485,971,800	958,093,750	79,761,304,687,500	1,890,918,000	0.2246
Gulf Africa	896,259,000	100,457,400	462,171,250	38,475,756,560,000	3,509,281,000	0.1409

n	0	80	0	2,500	000	
Bank						
Giro						0.2159
Comm	1,775,683,0	289,077,4	1,205,047,	100,320,204,3	5,139,918,	
ercial	00	70	500	75,000	000	
Bank						
Equat						0.1055
orial	206,433,50	37,933,77	116,986,25	9,739,105,312,	388,075,0	
Comm	0	0	0	500	00	
ercial						
Bank						
Fidelit						0.1061
y	940,621,50	62,465,44	380,641,25	31,688,384,06	1,706,808,	
comm	0	0	0	2,500	000	
ercial						
bank						
KRep						0.2611
bank	287,196,00	73,478,47	435,162,50	36,227,278,12	1,327,036,	
	0	0	0	5,000	000	
Devel						0.1379
opmen	64,655,500	30,941,37	58,047,500	4,832,454,375,	422,731,0	
t Bank		0		000	00	
of						
kenya						
Transn						0.0664
ational	60,105,500	55,997,47	182,938,75	15,229,650,93	1,121,988,	
Bank		0	0	7,500	000	

Habib Bank A.G Zurich	665,392,00 0	50,345,28 0	447,291,25 0	37,236,996,56 2,500	2,278,632, 000	0.2985
Guardi an Bank	1,483,982,5 00	206,392,3 40	362,467,50 0	30,175,419,37 5,000	4,221,895, 000	0.0699
Victor ia Comm ercial bank	271,362,00 0	74,352,52 0	298,026,25 0	24,810,685,31 2,500	1,833,519, 000	0.2310
Habib Bank	109,882,50 0	42,129,21 0	169,105,00 0	14,077,991,25 0,000	416,594,0 00	0.2637
Orient al Comm ercial Bank	287,924,00 0	35,719,51 0	121,946,25 0	10,152,025,31 2,500	622,003,0 00	0.0336
Credit Bank	294,840,00 0	31,290,99 0	191,115,00 0	15,910,323,75 0,000	1,246,172, 000	0.1140
Param ount Univer sal	99,918,000	42,886,72 0	46,810,000	3,896,932,500, 000	348,004,0 00	0.0797

Bank						
Middle East Bank	195,422,500	52,209,920	43,555,000	3,625,953,750,000	445,474,000	0.0487
Dubai Bank Kenya	128,856,000	40,264,570	51,382,500	4,277,593,125,000	627,418,000	0.2093
Bank of Africa Kenya Ltd	1,167,985,000	42,653,640	2,708,315,000	225,467,223,750,000	1,711,501,000	0.3241
City Finance Bank Ltd	199,381,000	6,817,590	123,728,750	10,300,418,437,500	1,861,316,000	0.3244
Commercial Bank of Africa Ltd	391,937,000	35,020,270	153,450,000	12,774,712,500,000	671,821,000	0.1645
Eco Bank Limited	962,416,000	72,954,040	174,840,000	14,555,430,000,000	1,469,631,000	0.2581

South ern Credit Banki ng Corpo ration Ltd	743,834,000	244,792,270	546,026,250	45,456,685,312,500	755,934,000	0.3569
United Bank of Africa Kenya Bank Limite d	405,860,000	363,022,100	375,526,250	31,262,560,312,500	1,943,263,000	0.3609
Famil y Bank Ltd	2,179,541,000	65,961,640	513,592,500	42,756,575,625,000	887,338,000	0.1095
First Comm unity Bank Ltd	755,937,000	420,068,430	591,751,250	49,263,291,562,500	2,357,330,000	0.0345
Invest ment	465,738,000	392,914,600	667,856,250	55,599,032,810	1,303,932,000	0.2277

& Mortg ages Bank Ltd	0	10	0	2,500	000	
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2011

	ATM Cards	CR Cards	DR Cards	e banking	Mobile banking	Operationa l Efficiency
Kenya Comm ercial Bank	89,757,668, 000	7,146,815 ,500	35,871,456 ,250	2,986,298,732, 812,500	4,457,989, 000	0.2823
Equity Bank	22,823,937, 500	2,341,929 ,570	3,104,688, 750	258,465,338,4 37,500	16,360,52 0,000	0.3290
Barcla ys Bank	4,806,711,0 00	6,446,002 ,210	4,438,076, 250	369,469,847,8 12,500	34,710,87 2,000	0.3425
Coope rative Bank of Kenya	4,077,755,5 00	938,846,2 40	1,751,965, 000	145,851,086,2 50,000	12,726,33 3,000	0.2752
Standa rd	5,944,120,0	53,258,78	770,776,25	64,167,122,81	3,949,701,	0.3794

Chartered Bank	00	0	0	2,500	000	
CFC Stanbic Bank	11,837,143,500	94,280,860	451,980,000	37,627,335,000	25,520,173,000	0.2096
Citibank N.A	511,829,500	53,899,750	280,550,000	23,355,787,500	1,527,030,000	0.2234
Diamond Trust Bank	448,448,000	53,899,750	3,126,466,250	260,278,315,312,500	226,708,000	0.3564
NIC Bank	4,706,110,500	55,356,500	782,440,000	65,138,130,000	2,987,275,000	0.3060
National Bank of Kenya	1,812,947,500	56,871,520	3,705,740,000	308,502,855,000	3,902,771,000	0.2717
Bank of Baroda	437,755,500	8,274,340	251,216,250	20,913,752,812,500	2,632,773,000	0.3852
Prime						0.1974

Bank	511,511,00 0	44,984,44 0	191,192,50 0	15,916,775,62 5,000	1,226,678, 000	
Chase Bank	1,620,027,5 00	124,406,4 50	520,141,25 0	43,301,759,06 2,500	4,297,705, 000	0.3120
Imperi al Bank	1,401,809,5 00	559,450,2 70	1,511,715, 000	125,850,273,7 50,000	1,087,332, 000	0.4031
Bank of India	57,239,000	504,268,5 80	553,311,25 0	46,063,161,56 2,500	2,653,711, 000	0.3594
Fina bank	5,021,880,5 00	101,506,3 40	621,511,25 0	51,740,811,56 2,500	1,106,104, 000	0.1132
Conso lidated Bank of kenya	895,895,00 0	594,120,9 20	722,261,25 0	60,128,249,06 2,500	3,959,087, 000	0.1745
Africa bank Corpo ration	968,922,50 0	539,172,3 10	1,068,027, 500	88,913,289,37 5,000	2,358,052, 000	0.2946
Gulf Africa n Bank	1,042,268,5 00	106,226,2 10	35,688,750	2,971,088,437, 500	3,982,191, 000	0.0384

Giro Comm ercial Bank	1,966,146,0 00	292,573,6 70	1,253,213, 750	104,330,044,6 87,500	5,433,411, 000	0.4735
Equat orial Comm ercial Bank	224,360,50 0	42,304,02 0	125,821,25 0	10,474,619,06 2,500	416,233,0 00	0.0370
Fidelit y comm ercial bank	959,731,50 0	71,905,18 0	466,511,25 0	38,837,061,56 2,500	2,134,232, 000	0.4699
KRep bank	329,829,50 0	80,529,14 0	530,681,25 0	44,179,214,06 2,500	1,491,652, 000	0.0955
Devel opmen t Bank of kenya	76,076,000	39,507,06 0	58,900,000	4,903,425,000, 000	458,109,0 00	0.1585
Transn ational Bank	69,979,000	71,963,45 0	191,076,25 0	15,907,097,81 2,500	1,174,694, 000	0.1029
Habib Bank	683,046,00	50,986,25	462,442,50	38,498,338,12	2,612,196,	0.2215

A.G Zurich	0	0	0	5,000	000	
Guardi an Bank	1,593,592,0 00	287,387,6 40	414,431,25 0	34,501,401,56 2,500	4,446,798, 000	0.1177
Victor ia Comm ercial bank	342,706,00 0	96,611,66 0	369,442,50 0	30,756,088,12 5,000	2,063,476, 000	0.2819
Habib Bank	143,416,00 0	55,822,66 0	196,268,75 0	16,339,373,43 7,500	549,803,0 00	0.2624
Orient al Comm ercial Bank	331,922,50 0	54,249,37 0	126,751,25 0	10,552,041,56 2,500	709,365,0 00	0.1607
Credit Bank	327,782,00 0	40,497,65 0	203,553,75 0	16,945,849,68 7,500	1,392,016, 000	0.0355
Param ount Univer sal Bank	109,109,00 0	50,345,28 0	47,895,000	3,987,258,750, 000	429,951,0 00	0.3578
Middl						0.2001

e East Bank	232,459,50 0	53,666,67 0	98,115,000	8,168,073,750, 000	552,330,0 00	
Dubai Bank Kenya	139,275,50 0	41,954,40 0	63,743,750	5,306,667,187, 500	671,821,0 00	0.0056
Bank of Africa Kenya Ltd	695,831,50 0	75,459,65 0	380,641,25 0	31,688,384,06 2,500	2,885,112, 000	0.1306
City Financ e Bank Ltd	683,774,00 0	245,782,8 60	1,018,776, 250	84,813,122,81 2,500	4,684,336, 000	0.0778
Comm ercial Bank of Africa Ltd	162,071,00 0	25,114,37 0	82,305,000	6,851,891,250, 000	325,622,0 00	0.1089
Eco Bank Limite d	853,944,00 0	48,014,48 0	282,022,50 0	23,478,373,12 5,000	1,439,307, 000	0.1527
Southe rn	214,805,50	42,245,75	335,226,25	27,907,585,31	1,068,560,	0.1865

Credit Banki ng Corpo ration Ltd	0	0	0	2,500	000	
United Bank of Africa Kenya Bank Limite d	44,681,000	21,093,74 0	41,113,750	3,422,719,687, 500	266,418,0 00	0.1376
Famil y Bank Ltd	51,233,000	40,905,54 0	121,093,75 0	10,081,054,68 7,500	766,042,0 00	0.0732
First Comm unity Bank Ltd	587,541,50 0	40,264,57 0	392,731,25 0	32,694,876,56 2,500	1,923,769, 000	0.2751
Invest ment & Mortg	1,195,512,5 00	171,080,7 20	260,748,75 0	21,707,333,43 7,500	3,561,265, 000	0.0310

ages						
Bank						
Ltd						

2012

	ATM Cards	CR Cards	DR Cards	e banking	Mobile banking	Operationa l Efficiency
Kenya Comm ercial Bank	118,852,91 6,000	8,481,781 ,200	39,202,987 ,500	3,263,648,709, 375,000	4,909,961, 000	0.3118
Equity Bank	23,733,710, 000	2,456,138 ,770	3,588,715, 000	298,760,523,7 50,000	17,804,52 0,000	0.3453
Barcla ys Bank	5,028,751,0 00	6,743,062 ,670	4,503,331, 250	374,902,326,5 62,500	41,198,76 4,000	0.4111
Coope rative Bank of Kenya	4,118,796,5 00	1,065,233 ,870	2,794,688, 750	232,657,838,4 37,500	15,184,74 3,000	0.2941
Stand ard Charte red	6,476,470,0 00	55,356,50 0	779,688,75 0	64,909,088,43 7,500	4,377,486, 000	0.4011

Bank						
CFC						0.3082
Stanbic Bank	13,476,736,000	114,267,470	189,603,750	15,784,512,187,500	35,211,940,000	
Citibank N.A	620,165,000	58,969,240	346,192,500	28,820,525,625,000	1,678,650,000	0.3177
Diamond Trust Bank	6,947,440,500	59,901,560	858,738,750	71,490,000,937,500	2,981,860,000	0.3134
NIC Bank	1,871,233,000	60,717,340	4,248,666,250	353,701,465,312,500	3,914,323,000	0.3395
National Bank of Kenya	1,871,233,000	59,493,670	4,636,088,750	385,954,388,437,500	3,650,432,000	0.2337
Bank of Baroda	484,484,000	8,915,310	257,300,000	21,420,225,000,000	2,650,462,000	0.3396
Prime Bank	573,755,000	53,491,860	195,338,750	16,261,950,937,500	108,661,000	0.2888

Chase Bank	2,098,960,5 00	154,590,3 10	760,701,25 0	63,328,379,06 2,500	5,558,678, 000	0.2862
Imperi al Bank	1,608,197,5 00	62,640,25 0	1,643,232, 500	136,799,105,6 25,000	1,155,561, 000	0.4428
Bank of India	678,405,00 0	536,142,2 70	629,261,25 0	52,385,999,06 2,500	3,550,074, 000	0.2887
Fina bank	529,210,50 0	114,267,4 70	640,576,25 0	53,327,972,81 2,500	1,156,283, 000	0.2022
Conso lidated Bank of kenya	1,054,872,0 00	642,193,6 70	738,885,00 0	61,512,176,25 0,000	5,665,173, 000	0.1718
Africa bank Corpo ration	1,092,500,5 00	596,509,9 90	1,186,486, 250	98,774,980,31 2,500	3,123,011, 000	0.3028
Gulf Africa n Bank	1,066,929,5 00	115,491,1 40	579,312,50 0	48,227,765,62 5,000	4,765,922, 000	0.1178
Giro Comm	2,246,517,0 0	304,810,3 3	1,363,341, 0	113,498,159,0 0	5,499,474, 0	0.2090

ercial Bank	00	70	250	62,500	000	
Equat orial Comm ercial Bank	242,105,50 0	50,170,47 0	136,128,75 0	11,332,718,43 7,500	454,499,0 00	0.0591
Fidelit y comm ercial bank	1,069,341,0 00	89,852,34 0	590,976,25 0	49,198,772,81 2,500	2,354,081, 000	0.2964
KRep bank	395,577,00 0	82,335,51 0	608,065,00 0	50,621,411,25 0,000	1,638,579, 000	0.1923
Devel opmen t Bank of kenya	91,591,500	44,401,74 0	66,650,000	5,548,612,500, 000	518,396,0 00	0.1008
Transn ational Bank	115,706,50 0	111,645,3 20	194,796,25 0	16,216,787,81 2,500	1,269,276, 000	0.1692
Habib Bank A.G Zurich	699,016,50 0	56,871,52 0	477,206,25 0	39,727,420,31 2,500	2,721,218, 000	0.1982

Guardian Bank	1,666,710,500	305,393,070	438,998,750	36,546,645,937,500	4,768,449,000	0.1594
Victoria Commercial bank	439,211,500	135,536,020	353,593,750	29,436,679,687,500	2,232,063,000	0.2632
Habib Bank	234,234,000	61,591,390	205,258,750	17,087,790,937,500	655,937,000	0.2551
Oriental Commercial Bank	392,710,500	54,715,530	163,447,500	13,607,004,375,000	979,032,000	0.1493
Credit Bank	446,491,500	42,653,640	269,196,250	22,410,587,812,500	1,559,881,000	0.0535
Paramount Universal Bank	112,658,000	53,433,590	59,791,250	4,977,621,562,500	727,054,000	0.1100
Middle East Bank	233,369,500	52,734,350	98,076,250	8,164,847,812,500	555,218,000	0.0840

Dubai Bank Kenya	145,691,000	61,999,280	99,742,500	8,303,563,125,000	716,946,000	0.0292
Bank of Africa Kenya Ltd	133,406,000	50,753,170	161,742,500	13,465,063,125,000	1,527,391,000	0.2299
City Financ e Bank Ltd	70,479,500	33,097,360	115,630,000	9,626,197,500,000	311,904,000	0.2044
Comm ercial Bank of Africa Ltd	143,143,000	24,997,830	101,641,250	8,461,634,062,500	484,462,000	0.2554
Eco Bank Limite d	93,957,500	25,580,530	95,828,750	7,977,743,437,500	1,034,987,000	0.2329
Southe rn Credit Banki	85,312,500	40,614,190	44,020,000	3,664,665,000,000	231,762,000	0.0947

ng Corpo ration Ltd						
United Bank of Africa Kenya Bank Limite d	162,526,00 0	42,245,75 0	38,207,500	3,180,774,375, 000	706,477,0 00	0.1069
Famil y Bank Ltd	57,284,500	19,870,07 0	28,597,500	2,380,741,875, 000	492,043,0 00	0.0339
First Comm unity Bank Ltd	4,396,255,5 00	4,750,228 ,670	2,906,482, 500	241,964,668,1 25,000	11,610,48 2,000	0.6022
Invest ment & Mortg ages Bank	1,820,500,5 00	419,602,2 70	973,361,25 0	81,032,324,06 2,500	5,978,521, 000	0.4503

Ltd						
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2013

	ATM Cards	CR Cards	DR Cards	e banking	Mobile banking	Operational Efficiency
Kenya Commercial Bank	115,191,98 6,000	8,839,325 ,920	48,076,737 ,500	4,002,388,396, 875,000	18,815,320 ,000	0.2980
Equity Bank	27,992,282, 500	3,030,739 ,240	3,923,476, 250	326,629,397,8 12,500	19,299,421 ,000	0.3760
Barclays Bank	6,945,802,5 00	6,789,620 ,400	4,693,206, 250	390,709,420,3 12,500	44,652,812 ,000	0.4400
Coperative Bank of Kenya	4,669,255,5 00	1,171,926 ,240	3,452,663, 750	287,434,257,1 87,500	16,649,320 ,000	0.3310
Standard Chartered Bank	6,856,440,5 00	65,553,75 0	1,013,506, 250	84,374,395,31 2,500	5,638,098, 000	0.3760
CFC Stanbi	13,719,205,	152,317,7	445,780,00	37,111,185,00	44,434,046	0.2600

c Bank	500	80	0	0,000	,000	
Citibank N.A	733,460,000	111,412,240	39,370,000	3,277,552,500	2,144,340,000	0.4170
Diamond Trust Bank	462,371,000	117,239,240	3,708,026,250	308,693,185,312,500	465,690,000	0.3140
NIC Bank	9,813,940,500	123,241,050	936,277,500	77,945,101,875,000	36,519,482,000	0.2860
National Bank of Kenya	2,372,916,000	68,234,170	4,827,010,000	401,848,582,500,000	5,502,723,000	0.1100
Bank of Baroda	487,487,000	9,731,090	295,740,000	24,620,355,000	3,054,421,000	0.2890
Prime Bank	678,905,500	59,493,670	203,437,500	16,936,171,875,000	1,285,882,000	0.2780
Chase Bank	2,647,827,000	264,487,530	934,921,250	77,832,194,062,500	6,328,691,000	0.2580

Imperial Bank of India	1,911,728,000	716,954,080	1,674,038,750	139,363,725,937,500	1,285,521,000	0.4200
Bank of India	747,474,000	614,224,070	796,041,250	66,270,434,062,500	3,666,677,000	0.1490
Financial bank	577,349,500	117,938,480	282,642,500	23,529,988,125,000	1,285,521,000	0.1390
Consolidated Bank of Kenya	1,346,845,500	717,595,050	1,240,620,000	103,281,615,000,000	7,266,930,000	0.1120
Africa Bank Corporation	1,138,364,500	708,446,660	1,262,320,000	105,088,140,000,000	3,545,381,000	0.2640
Gulf Africa Bank	1,644,142,500	120,211,010	658,168,750	54,792,548,437,500	5,126,561,000	0.2390
Giro Commercial Bank	2,412,046,000	316,464,370	1,395,581,250	116,182,139,062,500	5,825,457,000	0.1170
Equat						0.9080

orial Comm ercial Bank	262,398,50 0	57,454,22 0	164,726,25 0	13,713,460,31 2,500	583,015,00 0	
Fidelit y comm ercial bank	1,346,845,5 00	124,522,9 90	682,891,25 0	56,850,696,56 2,500	2,502,091, 000	0.0860
KRep bank	448,857,50 0	88,745,21 0	642,048,75 0	53,450,558,43 7,500	1,730,273, 000	0.2010
Devel opmen t Bank of kenya	97,097,000	56,405,36 0	72,075,000	6,000,243,750, 000	551,247,00 0	0.0630
Transn ational Bank	169,806,00 0	123,648,9 40	219,247,50 0	18,252,354,37 5,000	1,521,976, 000	0.1760
Habib Bank A.G Zurich	729,319,50 0	59,901,56 0	485,576,25 0	40,424,222,81 2,500	2,864,896, 000	0.2690
Guardi an Bank	1,781,234,0 00	305,684,4 20	487,010,00 0	40,543,582,50 0,000	5,155,441, 000	0.1830

Victoria Commercial Bank	577,577,000	147,481,370	382,152,500	31,814,195,625,000	2,271,773,000	0.2410
Habib Bank	296,614,500	78,198,340	208,513,750	17,358,769,687,500	1,175,416,000	0.3380
Oriental Commercial Bank	483,574,000	67,068,770	202,933,750	16,894,234,687,500	1,033,904,000	0.0820
Credit Bank	535,489,500	57,512,490	297,677,500	24,781,651,875,000	1,632,803,000	0.0690
Paramount Universal Bank	115,706,500	57,454,220	60,566,250	5,042,140,312,500	770,735,000	0.0790
Middle East Bank	346,664,500	59,726,750	242,303,750	20,171,787,187,500	774,345,000	0.0420
Dubai Bank Kenya	208,526,500	88,803,480	138,957,500	11,568,211,875,000	1,060,257,000	0.0330

Bank of Africa Kenya Ltd	4,100,733,0 00	53,608,40 0	346,890,00 0	28,878,592,50 0,000	17,577,090 ,000	0.4676
City Financ e Bank Ltd	105,059,50 0	24,473,40 0	113,925,00 0	9,484,256,250, 000	381,216,00 0	0.5446
Comm ercial Bank of Africa Ltd	314,632,50 0	19,870,07 0	2,718,777, 500	226,338,226,8 75,000	145,122,00 0	0.5409
Eco Bank Limite d	3,008,505,5 00	24,997,83 0	547,188,75 0	45,553,463,43 7,500	343,672,00 0	0.4509
South ern Credit Banki ng Corpo ration	917,325,50 0	40,206,30 0	1,942,188, 750	161,687,213,4 37,500	1,368,190, 000	0.5430

Ltd						
United Bank of Africa Kenya Bank Limited	14,878,500	6,001,810	6,548,750	545,183,437,500	46,208,000	0.5953
Family Bank Ltd	305,805,500	30,824,830	124,232,500	10,342,355,625,000	437,532,000	0.4047
First Community Bank Ltd	755,345,500	57,629,030	122,643,750	10,210,092,187,500	906,832,000	0.4747
Investment & Mortgages Bank Ltd	696,195,500	215,074,570	511,538,750	42,585,600,937,500	671,821,000	0.5018