

IMPACT OF INVESTMENT IN INFORMATION TECHNOLOGY ON THE RETURN ON ASSETS OF SELECTED BANKS IN NIGERIA

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ABSTRACT

This paper investigates the impact of investment in information technology on the return on assets of selected banks in Nigeria for the period 2000-2010, using independent variables (MIS surrogates) which comprise of software, hardware investment, and number of ATMs, while the financial performance as a variable is proxied by the return on assets. The study employed secondary data generated from annual reports and accounts of selected banks quoted in the Nigerian Stock Exchange (NSE). The data were analyzed using multivariate regression analysis; that is the Statistical Package for Social Sciences (SPSS). It was found that MIS surrogates which are software, hardware investment and number of ATMs had a significant impact on financial performance of Nigeria banks as measured by return on assets (ROA) because t- statistics results are all significant at 1 percent. The study recommends that banks should increase investment in software, hardware and ATMs which will enhance their Management Information System (MIS) and profitability.

Key Words: Management information system, Return on assets, Financial Performance, impact, banks.

1.0 INTRODUCTION

Information is a critical resource in the operation and management of organizations. Timely availability of relevant information is vital for effective performance of managerial functions such as planning, organizing, leading, and control. An information system in an organization is like the nervous system in the human body: it is the link that connects all the organization's components together and provides for better operation and survival in a competitive environment. Indeed, today's organizations run on information. An information system encompasses transaction processing systems, management information systems, decision support systems, and strategic information systems. Information consists of data that have been processed and are meaningful to a user.

Thus a management information system collects, transmits, processes, and stores data's for the accomplishments of an organization information need. The system makes possible the conversion of these data into management information for use by decision makers within the organization, thereby affecting returns on assets. A management information system, therefore, produces information that supports the

management functions of an organization (Davis & Olson, 1985; Lucas, 1990; McLeod, 1995). In recent years, the utilization of information technology has been magnificently increased in service industries, particularly, the banking industry, which by using Information Technology related products such as internet banking, electronic payments, security investments and information exchanges (Berger, 2003). Financial institutions can deliver high quality services to client with less effort which has an impact on returns on assets.

In a Bank's information system, there are always potentials of crisis which make the bank endure an insufficiency; thus, advanced information system supported by a superior mechanism control is required to make certain that an information system has achieved the required targets. Surprisingly, some literatures defend the idea of Solow Paradox in concluding that Information Technology may essentially affect negatively on banks return on assets and may reduce profitability. This notion was noted by Solow (1987), "you can see the computer age everywhere these days, but in the productivity statistics". The paradox has been defined by Turban, Rainer and Potter (2008) as the "discrepancy between measures of investment in information technology and measures of output at the national level.

Shu and Stressmann (2005) conducted a survey on 12 banks in the US for the period of 1989-1997. They noticed that even though Information and communication Technologies have been one of the most essential dynamic factors relating all efforts, it cannot improve banks' earnings in terms of return on assets. However, there are many literatures approving the positive impacts of Information and communication Technology expenses on business value ((Brynjolfsson and Hitt (2000) and Kozak,(2005)). Brynjolfsson and Hitt (2000) indicate that Information Technology capital contributes 81% marginal increase in output, whereas non Information Technology capital contributes 6%. In another study, Saloner and Shepard, (1995) used data spanning the period 1971 – 1979. The study investigates the relationship between Information and communication technology and banks' performance in the United States of America. The study revealed two positive outcomes. Firstly, Information technology brings down the operational costs of the banks (the cost advantage). For instance, internet technology facilitates and speeds up banks procedures to accomplish standardized and low value-added transactions. The second outcome showed that Information Technology promotes transaction between customers within the same network. Also, the study showed that the interest of network effect is significant in utilizing Automated Teller Machines (ATMs). Milne (2006) supports the view of the authors above when he maintained that modernization of IT has set the stage for extraordinary improvement in banking procedures throughout the world.

From the above discourse, this paper seeks to carry out an impact assessment of Management information System (MIS) on returns on assets of selected banks in Nigeria. The study specifically assesses how the adoption of MIS by banks' management in Nigeria impacted on the financial performance of their banks in term of returns on assets. The specific objective of this study is to determine the impact of software, hardware and ATMs on the returns of assets on Nigerian banks.

To achieve the above objectives of this study, the hypothesis below is formulated for testing:

H_{O1}: Management information System has no significant impact on returns on assets of Nigerian banks

H_{A1}: Management information System has significant impact on returns on assets of Nigerian banks.

Furthermore, the paper basically is divided into five sections. Section One is the introduction as above; Section Two is the literature review and theoretical framework, followed by Section Three which is the methodology adopted for the study. Section Four is discussion of results and findings, and Section Five is about conclusion and recommendations.

2.0 LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 The Subject of Information Technology and Management

There is a large body of literature on the general subject of information technology (IT). Clarke (1994) describes how the applications of IT have evolved over the years: from the initial role of IT in the 1960's as a way of automating business processes, through the recognition in the 1970's of IT's role in helping to better manage and control an organization, to the ideas in the 1980's of using IT for strategic advantage. Zuboff (1985) uses the terms automate, inform ate, and transform to categorize different ways IT can be used. Automate is the label that covers transaction processing and other IT applications designed to support and facilitate normal everyday business processes. Inform ate describes management support, decision support, and data warehousing types of applications, while transform refers to IT applications that significantly change the market and business environment, often labelled as strategic applications.

Over the last decade, the literature has emphasized the various roles of IT in fundamentally changing the way firms operate and in generating a strategic impact. One of the more important roles of IT is in extending the enterprise. IT can be used to transform organizational boundaries, inter-organizational relations, and marketplace competitive and cooperative practices (Konsynski, 1993, Simon and Grover, 1993). Other examples in the literature that describe ways in which IT can be used to transform the enterprise include the strategic opportunities matrix of Benjamin et al. (1984), the information intensity matrix to assess IT's role (Porter and Miller, 1985), the strategic thrusts framework of Wiseman (1985), and McFarland's strategic grid (1984).

However, this section reviews literatures that are relevant to the problem under investigation. The review covers empirical studies and theoretical framework on management information system and financial performance.

2.2 An overview of Information System in Banking

Although Information System (IS) expenditure is regarded as costly and risky, financial institutions are one of the largest investors in IS (Robson, 1997). The past 25 years have witnessed vast reductions in the cost of information technology. Between 1995 and 2005, the computing power of the average personal computer (PC) increased tremendously, while the price declined. The introduction of telecommunications into bank markets dates back to 1846 when the telegraph reduced stock price differentials between New York and regional stock markets. At the same time, a revolution in telecommunications reduced the cost of transmitting data by a high margin since 1990 (Garbade and Silber, 1978). Such cost reductions have made it less expensive to acquire, store, transmit, and transform data into information. They have also created enormous changes in the services of the financial institution.

The characteristic provision of financial services in retail markets was to change with the commercial use of computer power. For commercial banking worldwide, these advances in IT have resulted in dramatic productivity gains. One early example was the introduction of the automatic teller machine (ATM), which first appeared in the United States in 1968. The introduction of ATMs made the distribution of some banking services more efficient as it reduces time wastage in financial transactions. IT has developed the competition between financial institutions. Many new banking innovative strategies emerged from a new or enhanced banking information systems, which include e-banking, smartcard system or enhancement of other payment card system. Before the emergence of ATMs, withdrawing funds, account inquiries and transferring funds between accounts requires face-to-face interaction between the customer and a bank teller.

An interesting finding of Morton (1991) supported by Hitt & Brynjolfsson (1996) and by Hayward *et al* (2002), is that benefits from IT do in fact exist, but are not captured by the institution.

According to Gupta and Collins (1997), there are four popular efficiency measures used to assess MIS return, which are as follows: reduced operating expenses; increased profitability; increased fee income as percentage of total revenue and increased net-interest margin to average earning assets. In Nigeria, some studies have been conducted on MIS and banks' performance. Dogarawa (2006), Agboola (wwwwww) have conducted some studies on MIS and customer satisfaction in Nigeria. This present study basically looks at the impact of MIS on the returns on assets of some selected banks in Nigeria which is an area that previous studies did not investigate.

In spite of the disagreement among researchers on the assumptions and evaluation factors of IS, the following factors represent the common factors used in the evaluation of financial information systems performance. (a) IT integrated in IS: information technology is important to understand the relationship between information technology investment and firm productivity. Mitra and Chaya (1996) found that IT investments reduce average production costs, and increase average overhead costs in firms. Alpar and Kim (1990) reported that investments in information technology decrease total costs in the banking industry. Harris and Katz (1991) found that higher information technology spending is associated with lower growth in operating cost of insurance companies. Morison and Brandt (1990), found, from government data, that technology provides only marginal returns and concluded that there was over-investment in IT.

2.3 Management Information System and Nigerian Banking Sector

The revolution in MIS has made the banking sector changed from the traditional mode of operations to presumably better ways with technological innovation that improves efficiency. MIS can enhance efficiency via its use and recent time banks have been encouraged by the rapid decline in the price of ICT gadgets. This has perhaps increased the bank level of ICT usage (Ovia, 2005). The increase might have also been attributable to business environment that become relatively flexible to accommodate new forms of technological change as a result of reforms in the country.

Banking is becoming highly ICT based and because of its inter-sectoral link, it appears to be reaping most of the benefits of revolution in technology, as can be seen by its application to almost all areas of its activities (Akinuli, 1999). It has broadened the scope of banking practices and changed the nature of banking as well as the competitive in which they operate. A broad opening has been experienced around the world for banks and they are currently taking due advantage of these innovations to provide improved customer services in the face of competition and faster services that enhance productivity (Akinuli, 1999; Ovia, 2005).

Technological advancement facilities payments and creates convenient alternatives to cash and cheque for making transactions. Such new practices have led to the development of a truly global, seamless and internet enabled 24-hours business of banking. Technological advancement in payments is important due to the fact that it will be feasible to outsource quite a number of the banks' role in the payments system. Also banks regulation can be more technologically dependent and better focused rather than focusing on conceptual guidelines. ICT revolution both in terms of innovation rate, speedy operation, and cost per unit (portraying reduction in average total and marginal costs) has made a good number of banks embrace the use of ICT infrastructure in their operations (Akinuli, 1999).

The technological innovation that is being witnessed currently in the Nigerian banking sector is possible of impacting on the banks mode of transactions, especially in their payment systems. The payment systems are made feasible by ICT gadgets such as automated Teller Machine (ATM), Electronic Fund Transfer (EFT), Clearing House Automated Payments (CHAPs), Electronic Purse (E-PURSE), Automated Cheque Sorter (ACS) and Electronic and Transfer at point of Sale (EFTPOS), which have made transactions

easy and convenient. This phenomenon is capable of bringing about speedy operations and enhanced productivity as postulated by Adeoti, (2000) and Ovia, (2005).

Though there may be little interruptions at times due to network failures, which may make customers unable to carry out transactions at that point in time. This little shortcoming is not in any way comparable to the days when banking halls were characterized by long queues mainly as a result of delays in the traditional banking operations. Now banks can provide comprehensive services to their customers by making them access their accounts via online services. These instructions have an edge over the traditional payments because it is safer, more efficiency, convenient and cost effective. Before the introduction of these MIS services in the banking industry, manual processing of documents were in use. The bankers were made to cope with this onerous task, and the process made business transactions minimal. Besides several hectic procedures, people had to contend with, banks customers were inevitably made to spend several hours in the congested banking halls in carrying out their transaction (Ovia, 2005).

The MIS culture in Nigerian economy can be said to be on the increase. Nigeria is the largest internet subscriber in Africa with about 100,000 internet users as at 2000, which was estimated to have grossly increased. It has also been observed that Nigeria's IT usage had remarkable increased by more than 2.55% from 0.35% in 1992 to 9.3% in 2004, thereby greatly exceeding the International Telephone Unions (ITU) benchmark of 1% (Ndukwe, 2005). The phenomenon has helped banks keep substantial information on-line which reduces the cost of marketing their products. Being a competitive tool, it enhances the creation of customized services, reduces the cost of operation, and improves productivity as well as profitability.

More interestingly, almost all the banks in Nigeria have internet and on-line real time banking facilities which has improved the scope of Nigerian banking. It has aided transfer of funds from one location to another without any involvement of facial transactions thereby reducing the incidence of loss of funds to stealing and the likes. Another recent one is the telephone banking technology that allows customers to have transactions on their account by calling a particular telephone number, through voice activation, and using a tone pad. All of these improve the comfort of banking transactions.

2.4 Empirical Studies on Electronic Banking

Various studies have been conducted on MIS, online and internet banking in relation to its adaptation by banks and customers, performance of these banks and the risks and benefits associated with it. However, most of the studies paid more attention to online/internet banking which is part of MIS. Studies on the impact of MIS on financial performance, although scarce, are available for the US, European and Asian banking markets. Carlson *et al* (2000), investigated whether there is a link between offering internet banking and banks profitability. They developed statistical models to explain why banks choose to adopt internet banking and why some choose to offer a relatively wider array of internet banking products and services. They also investigated whether offering internet banking affects a bank's profitability.

The results revealed several significant differences in the profile of banks that offer internet banking and those that do not. They observed that internet banks rely more heavily in non-interest income and less on core deposits for funding than non-internet banks do. In addition, the study revealed that internet banks have better accounting efficiency ratio and higher returns in equity than non-internet banks. To this end, they regressed ROE against a set of control variables for banks that adopted internet as of quarters third, 1999. Based on the results obtained, they conclude that internet banking was too small a factor to have affected bank profitability at that time. This conclusion was in line with the previous findings of England, Fust, Nolle and Robertson (1998) who found no evidence of major differences in performance of internet banks in the US.

However, the authors expressed two caveats: Firstly, the result may not hold for all the banks and, secondly, the result is open to change over time as the banks become more intensive in their use of the internet. These findings are also similar with those of Sathye (2005) for the credit union in Australia for the year 1997 to 2001. He pointed out that internet banking has not proved to be a performance-enhancing tool in the context of major credit unions in Australia. Sullivan (2000) also found no systematic evidence that multichannel banks in the 10th Federal Reserve district were either helped or harmed by having transactional websites. Similarly, Lingam (2004) studied the impact of usability (user experience derived from the usability) of community banks' web banking efforts, particularly homepages, on their performance through heuristic evaluation of their web site homepages.

The study revealed that Web banking activities have significant positive impact on the banks' return on assets (ROA) and return on equity (ROE) and improves the asset equality indentifying non performing loans. Furthermore, increasing information Technology (IT) cost reduces ROA and ROE but improves loan quality. The results revealed that the impact of Web sites and Web banking application on the banks' performance can be expected to become pronounced in the long run if these web site are more usable for the masses because more usable web sites attract and retain more customers in the long run thereby increasing revenues, reducing customer support cost and increasing profits.

Other studies have examined the financial performance of primarily internet banks rely heavily, although not exclusively (e.g. telephone, ATM), on the internet as a delivery channel. De young (2005) indentifies and estimates the magnitude of technology based scale effects of a dozen of primarily internet banks in the US over the period 1997-2001. The author finds evidence of technology-based scale economies while the evidence on experience effects is rather weak. The empirical analysis demonstrates that profitability gaps with traditional banks if similar size and age shrink as primarily internet banks get larger. Kagan, Acharya, Rao and Kodepaka (2005) employed a structural equation model to examine whether index explain differences in community bank performance. Their findings revealed that online banking helps community banks improve their earning ability as measured by return on equity and improve assets quality by reducing the proportion of overdue or underperforming assets.

In Europe, the majority of the studies have focused on the performance of primarily internet banks: those that most heavily, though not exclusively, rely on internet as a delivery channel. Hernando and Nieto (2006) studied 27 commercial banks operating over a period of 9 years using regression analysis to determine Return on Asset, Return on Equity, Loans Deposits ICT cost, and Marketing costs. Their results show that impact on bank's performance takes time to appear. Cost reduction translates into improvement in bank's profitability, which becomes significant after one and half years in terms of ROA and after three years in terms of ROE.

In a related study, Delgado and Nieto (2004) studied the performance of banking institutions in Spain and concluded that their negative aggregate profitability until 2002 was due to higher financial cost and lower fee income, which seemed to reflect the fierce competition among internet banks and between them and traditional banks in Spain. Hernando and Nieto (2006) indentified and estimated the magnitude of technology based scale and technology based learning economies of fifteen European primarily internet banks. They concluded that the banks show strong evidence of technology based scale economies and their primary source seems to be the ability of primarily internet banks to control operational expenses even more efficiently than the traditional banks.

Similarly, the analysis of the performance of multichannel commercial banks (as opposed to traditional banks) has been the objectives of Hassan, Zazzara and Ciciretti (2005). These authors conclude that banks operating in Italy show a positive relationship between MIS adoption and profitability (ROA, ROE) over the period 1993-2001. In his own study, Siam (2006) investigated the role of MIS on the profits

of Jordanian banks. He revealed that MIS has a negative effect on banks profitability in the short run due to costs and investment in electronic infrastructure and skilled manpower.

In Nigeria, Dogarawa (2006) noted that the e-development is seriously impacting on performance of banks as it is affecting their productivity, efficiency, profitability, liquidity and capitalisation. It is also impacting on customer satisfaction and banking operations as a whole. In Nigerian context, many publications throw light over the importance of MIS and also its prospect for the Nigeria banking industry. However these studies don't depict any empirical relationship between banks financial performance and MIS. In conclusion, the impact of MIS on the financial performance of banks can be seen to be insignificant especially in the short run due to high costs of investment in Information and Communication Technology (England, Furst, Nolle and Robertson, 1999; Furst Lang and Nolle, 2000; Sullivan, 2000; Degaldo and Nieto, 2004; Sathye, 2005; De young, 2006; Dogarawa, 2006; and Siam,2006).

However, latest studies seem to find a positive relationship between MIS and profitability. The impact of MIS on financial performance especially on ROA is likely to improve in the long run as banks are deploying more electric banking products and services that will attract even more customers, reduce staff costs and general expenses as a whole (Lingam, 2004; Hassan, Zazzara and Ciciretti, 2005; De young, Lang and Nolle, 2006; Hernando and Nieto, 2006; Nelson and Richmond, 2007; and Acharya, Kagan, Lingam and Gray, 2008).

3.0 METHODOLOGY

The study uses both descriptive and field survey research methods with a population of 21 banks as quoted in the Nigerian Stock Exchange (NSE). The research uses secondary data generated from annual reports of selected banks as published by the Nigerian Stock Exchange. It is a time series data therefore the data to be used for this study is pooled data that examines the impact of management information system on the Return on assets of banks in Nigeria. The data so collected were analyzed using multivariate regression analysis and descriptive statistic, using computer data analysis, software, the statistical package for social sciences strata (SPSS).

3.1 Model Specification

The Ordinary Least Square (OLS) regression model was employed to estimate the combined effects of management information system (MIS) proxies on the individual financial performance surrogate return on assets (ROA). Along the line of Economides and Salop (1992), Saloner and Shepard (1995) and Shu and Strassmann (2005), the quality of MIS is estimated as a function of the banks information technology characteristic, which have been defined in the study as the number of ATMs owned by the banks, software investment and hardware investment made by the banks and the financial performance will be surrogated by Return on Assets(ROA).

The relationship between explanatory and dependent variables can be modelled mathematically as follows:-

$$\mathbf{Fin\ Perf.} = \alpha + \beta_1 \text{ software} + \beta_2 \text{ hardware} + \beta_3 \text{ ATM} + \mu$$

However, this model is concerned with Ordinary Least Square (OLS) regression in measuring the impact of independent factors on the financial performance matrix Return on Assets (ROA) as follows;-

$$\mathbf{ROA} = \alpha + \beta_1 \text{ software} + \beta_2 \text{ hardware} + \beta_3 \text{ ATM} + \mu$$

Where: α = constant

β_1 to β_3 = parameters to be estimated

μ = error term

3.2. Estimating MIS and financial performance variables

Independent variables (MIS surrogates) are:

1. Software:- It is the net investment in software during the period i, it is one of the independent variables.
2. Hardware:- It is the net investment in computer hardware equipment in the period i it is the one of the independent variables.
3. ATM: - The number of ATMs owned by the banks in the period i, it is one of the independent variable.

Financial Performance as dependent variable is:

Return on Assets (ROA) which is measured by net profit as a percentage of the total assets.

i.e.
$$\text{Return On Assets (ROA)} = \frac{\text{Profit After Tax}}{\text{Total Assets}}$$

4.0 DISCUSSION OF RESULTS

In this section, the results of the regression equation of the independent variables and dependent variable, ROA are presented in table 4.1:

Table 4.1 Management Information system and Return on Assets

Variables	Coefficient	Std. Error	T statistics	P – value
Constant	-9.256	2.737	-3.382	0.001
Hard ware	0.234	0.024	9.669	0.000
Soft ware	0.620	0.054	11.578	0.000
ATM	1.259	0.236	5.334	0.000
R Square	0.692			
Adj R Sqr.	0.685			
F- Statistics	101.775			
F Sign	0.000			
D.Watson	0.924			

a) Predictors:(constant),

b) Dependent Variable: ROA

Source: Author's computation using SPSS

Table 4.1 relates ROA (dependent variable) to MIS (independent variable) proxies by investment in hardware HW, investment in software SW and number of ATM. The estimated regression relationship for ROA model is: $ROA = -9.256 + 0.234HW + 0.620SW + 1.259ATM$

The equation shows that the independent variables (HW, SW and ATM) have significant impact on the ROA. That is, increase in the level of investment in MIS guarantee increase in the ROA. Durbin Watson statistics shows auto correlation as the value is 0.924. However, since it is closer to 1.45, the serial correlation is not extreme. The coefficient factors of the independent variables indicate positive impact on the ROA all at 1 percent level of significant. This means that the adoption of management information system has positive impact on the financial performance of deposit money banks in Nigeria.

The *t*-statistics in the regression show that HW, SW and ATM have the value of 9.669, 11.578 and 5.334 respectively which are all significant at 1percent while the adjusted coefficient of determination (R^2) offers better explanation of the variations in ROA, as the value is about 68.5 percent. Also, the value of the F-statistics is 101.775 with a *p*-value of 0.000.

From the result, the null hypothesis can therefore be rejected. In other words, the result provides evidence that adoption of MIS has significant impact on the financial performance of Nigerian banks as measured by ROA.

The result provides support to the studies of Mitra and Chaya (1996) found that IT investments reduce average costs of services and thus, increases the banks' profitability. Alpar and Kim (1990) reported that investments in information technology decrease total costs in the banking industry. Harris and Katz (1991) found that higher information technology spending is associated with lower growth in operating cost of insurance companies.

5.0 CONCLUSION AND RECOMMENDATIONS

Return On Assets (ROA) – The return on assets measures the rate of return on the assets by the bank. It helps the analyst to judge managerial performance, measure the effectiveness of assets used and evaluates proposed capital expenditure projects. (ROA), in the words of Arma and Vainu (2002), is one of the most frequently used financial ratios by financial analysts. ROA measure the ability of bank management to generate income after all financial and non-financial cost and expenses have been removed for owners. (Carlson, Lang and Nolle, 2000; Lingam 2004; Kagan, Acharya, Rao and Kodepaka, 2005; Hassan, Zazzara and Cicirette, 2005; Dogarawa, 2006; and Hernando and Nieto, 2006).

This study has tried to fill a void in the body of knowledge with respect to the provision of current empirical information on the impact of management information technology on the ROA which is relatively unexplained area. It has also employed the use of (OLS) method of regression on the other hand the study has great benefits since increased investment in MIS acted positively on financial performance as deposited by the ROA of Nigeria banks. If a positive correlation has been established between banks profitability (performance) and increased investment in information technology, it then becomes imperative to increase ICT investment in order to increase profitability. This is based on the purview that the banking sector occupies a strategic position in economic transformation and development.

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