IMPACT ANALYSIS OF INFORMATION AND COMMUNICATION TECHNOLOGY ON FINANCE AND ECONOMIC GROWTH IN NIGERIA (2001 – 2011)

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Abstract

The study analyses an impact relationship of Information and Communication Technology (ICT) on Bank Performance and Economic Growth in Nigeria. The study obtained an annual data of selected commercial banks in Nigeria for an 11 years period i.e. 2001 – 2011. The data comprises of net profit, total assets, total equity, ATM machines including e-banking services of the stated banks. The ordinary least squares (OLS), among the commonly used models in analysing panel data were used. Results of the study reveals that the use of ICT, from random effects model, does not improve bank performance in the Nigerian commercial banks. However, increased profitability, total equity showed significant relationships between bank performance and hence economic growth in the country. Similarly, a positive influence on bank performance is also revealed but is not statistically significant. The conclusion draws is that improved investment in ICT equipment does not improve bank performance. Rather relevant policies which could boost bank performance in term of profitability, capitalisation and consolidation should be pursued which are also the main determinants of economic growth.

Keywords: Bank and financial system, economic growth, information and communication technology, profitability, capitalisation and returns on assets

Background to the study

Banks face serious challenges in managing the dynamic nature of their customers who are now very sophisticated and knowledgeable in the banking relationship. Thus, banks have developed so many strategies to be

more responsive to the demand of their customers and to manage the situation for survival and growth through reduced costs of operation, significant share of customer's transaction, profitability among others.

Eventually, the ICT became the lifeblood of any organisation for growth and development. Thus, the entire world is moving away from traditional banking to computerised banking applications. Consequently, there has been huge investment in ICT infrastructures and personnel. Related to this, there have been significant influxes of ICT companies, consultants and service providers over the years.

Furthermore organisations have deployed state of the art ICT infrastructures and experienced personnel for competitive reasons over the years. They have developed, applied and implemented the best ICT policy accordingly. Banks have been facing the top challenges of required ICT capital investments in human capacity building, deployment of equipments, systems or designing applications, etc due to the ever rapid changing ICT technology and the dynamism of the global ICT industry in particular.

Over the years, banks have invested huge capital in deployment of ICT solutions for front office and back office automation accordingly. However the ever increasing challenges of ICT deployment with the right choice had remained a burning issue in the banking industry with the ever increasing need of interdependence etc. It is against this background that this study sets to investigate and analyse the role of ICT in bank performance with reference to selected commercial banks in Nigeria (2001 – 2011).

Statement of the problem

Even though ICT is seen to be an important component of banking business in the world however, there were many research works on ICT on Finance and Economic growth in the banking industry that have identified major challenges facing ICT in promoting bank performance and economic growth in Nigeria and the world over.

Problems regarding the diffusion of smart card, e-payment innovations signifies the need for collaboration (interworking of the industry) to extend the scope of service which are not well developed in Nigeria. Unless collaboration is involved, the diffusion of smart cards may fail to achieve the potentialities that the innovation could command. It is argued that interoperability is the key to smart card adoption on a global scale. However, agreement among competing organisation has not yet been achieved. The innovators still compete to develop their own proprietary operating system technologies (Java, Multos, WFSC). Market share strategy and service orientation strategy) could not help the situation much.

Coupled with these problems is a situation where a bank issues an individual debit card that is associated with an account with a line of credit

and is also an ATM debit card, the individual can perform a number of different types of transactions with the same card. The line of credit could be accessed fraudulently, where the owner has recourse under consumer credit legislation and under regulation if the fraud involves electronic fund transfer (EFT). When automated teller machine (ATMs) or electronic point of sale (POS) terminals are used, his liability is limited under EFTA. If, however, the fraudulent use of the card directly debits his bank account in a paper-based transaction, the consumer has no recourse under current legislation. This is an example where the same card represents three different instruments, each of which, in the case of fraud, would require different actions by the consumer (Agbada, 2008). In order to analyse the link between bank performance on economic growth coupled with these problems, this study set to investigate and answer the following question:

a. To what extent does ICT enhance bank performance, finance and consequently economic growth with reference to some selected banks in Nigeria

Objectives of the study

The general objective of this study is to analyse the role of ICT in enhancing economic growth in Nigeria with reference to ICT and bank performance. Specifically this research work is to empirically test the extent to which ICT has enhanced economic growth in Nigeria with reference to performance of some selected commercial banks in the country.

Hypothesis of the study

This study will make use of the following null hypothesis:

H_0: There is no significant relationship between the level of ICT adoption and bank performance and consequently economic growth.

Scope and Limitations of the study

This study is to analyse the impact of ICT on Bank performance with reference to some selected commercial banks in Nigeria and its role in economic growth. It will also analyse the impact of ICT on banks level performance of commercial banks and bank management decision areas bordering on ICT application and the extent to which it has been adopted the selecting the commercial banks in Nigeria.

The study of this nature is normally faced with lack of accessibility to data because most of the data are classified and considered to be confidential in nature. However this limitation was overcome by relying on officials in the bank that were capable of furnishing the required information by virtue of their ranks and files. Another limitation is time constraint is a limitation to the study as the programme is a full-time. The research work is also

combined together with a course work. And lastly, financial constraint is another obstacle to this study. Funds are needed by the researcher for photocopying relevant materials, for searching documents from the internet etc. To meet these expenses, the researcher decide to use his salary for the purposes.

Empirical Literature

Information and Communication Technology (ICT) and Bank Performance

According to Wikipedia (the free encyclopedia), information and communication technology, (ICT) is often used as an extended synonym for information technology (IT). It is usually a more general term that stresses the role of unified communications and integrated telecommunications (telephone lines and wireless signals), intelligent building management systems and audio-visual systems in modern times. It is further stated that the term consists of all technical means used to handle information and aid communication, including computer and network hardware, communication middleware as well as necessary software. In other words, ICT consists of IT as well as telephony, broadcast media, all types of audio and video processing and transmission and network based control and monitoring functions.

Several authors have conducted investigation on the impact of ICT on the banking sector of the Nigerian economy. Agboola *et al* (2002) discussed the dimensions in which automation in the banking industry is manifested in Nigeria. They include (i) bankers automated clearing services, which involves the use of magnetic ink character reader (MICR) for cheque processing. It is capable of encoding, reading and sorting cheques (ii) automated payment systems; devices used here include automatic teller machine (ATM), plastic cards and electronic funds transfer. (iii) automated delivery channels: These include interactive television and the Internet.

Aregbeyen (2011) evaluated the impact of the re-engineering of operational processes on the First Bank Nigeria Plc using paired data samples for the period 1986 to 2008. The author utilized both descriptive and inferential analysis (t-test) to test the hypothesis that business re-engineering has no significant effect on the operational performance (First Bank Nig. Plc). The findings of the study show that re-engineering project significantly improved the profitability performance of the bank in the period under study.

Muhammad and Muhammad (2010) examined the impact of ICT on organizational performance using primary data collected through in-depth interviews and fields surveys of 48 manufacturing and 24 banking industry in Pakistan over the period 1994 through 2005. The data was tested using multiple linear regression model and ratio analysis. The conclusion of the

research show that ICT has positive impact on organizational performance of all the organizations investigated.

Madueme (2010) assessed the impact of information communication technology (ICT) on the efficiency of thirteen commercial banks in Nigeria using both primary and secondary data. The findings of the study revealed that information technology improved the efficiency of the banks. Alawneh and Hattab (2009) assessed the value of e-business at the bank level in Jordan using a survey data collected from 140 employees in seven pioneered banks. Based on simple multiple linear regressions analysis, their empirical findings showed that technology is found to have the strongest significant influence on bank performance.

Ombati *et al*. (2010) studied the relationship between technology and service quality in banking industry in Kenya using primary data drawn from a sample of 120 customers using e-banking services within the Central Business District, Nairobi. The authors used descriptive statistics such as correlation analysis, percentages and means to analyse the data. The findings of the study indicated a direct relationship between technology and service quality in the banking industry. Similarly, Uppal (2011) examined the growth of information technology in various bank groups in India using data collected over the period 2008 – 2009. The findings revealed that the growth of information technology led to high bank performance. By extension Beccalli (2005) investigated whether investment in information technology (IT) influences the performance of banking, using a sample of 737 European banks over the period 1994 – 2000. Using simple correlation coefficients, the findings revealed a negative and statistically significant correlation between profit efficiency and information technology.

Information and Communication Technology and Economic Growth: A Conceptual Review of the Linkage

The story of a business can be described around the words ‘expend money and recover with profit’. In the words of Druker (1968), a business is ‘an organ of society established with a purpose to create a customer’. Lyman and Carlo (1973) defined business ‘as one of the several approaches societies around the globe utilised to provide their members with the goods and sieves that they desire to satisfy their needs’. In a similar view, Richard (1984), likened a business to ‘an organised approach, used by individuals for the purpose of providing goods and services to people usually for a profit’. Osaze and Anao (1990), however viewed a business ‘as the endeavour of identifying a need and of providing goods or services designed to satisfy such need’.

According to Ajayi (2002) information technology is the technology of the future. It is a new development, which brings together the technologies

of microelectronics', computing and telecommunications. Stele and Wellington (1985) defines information technology as the 'storing processing and communicating vast amount of data'. Thompson (1982) defines it as the potent combination of computers, in which information could be stored and processed, and telecommunications by mean of which information can be transmitted to anybody, anywhere in the world.

Thus, information technology (IT) offers new forms of information storage and retrieval. It originated with the coming together of three technologies: Microelectronics, computers, and communications. Thompson (1982) observed that: "There are three key components of it. First, new ways to store information capacity and deeply photographic microforms of various kinds, magnetic storage in tapes and discs, optical storage and video disks etc. Secondly, new mechanisms to manipulate, scan and search such stored records, the large scale computer, the mini computer, the microprocessor and related devices. Thirdly, new facilities for cheap and rapid transmission of information over long distances – telecommunication systems and network".

The importance of IT on enabling enterprises to develop more effective and efficient operation and management processes has been pointed out by many authorities and scholars. Most banks provide comprehensive banking services to their numerous customers with just a few staff. This fact is achieved through the use of information technology. Besides, many commercial organisations have come to believe that their business prospect does not just rely on information handling and information technology at the margin in terms of efficiency, better productivity or lower costs. Rather they have been persuaded to believe that their long term existence depends on the successful use of information and that their future is critically dependent upon the identification, development and management of new and innovative information based activities to support management and deliver new products and services (Woherem, 1997). Similarly, organsiations in the public sector such as government, health, administrations and local authorities have sought new ways of providing services to citizens through the use of information technology. Finally information technology has played a key role in ensuring more efficient and effective operation and delivery of their products and services to customers. From all indications the application of information technology in all banking operations will intensify and spread more and more in this dispensation.

Boot and Schmeits (2005) observed that there are several reasons for this: first, higher competition is likely to be associated with less stable, shorter relationships between customers and banks, because customers' propensity to switch to other providers increases in more competitive environments. This phenomenon will amplify information asymmetries that require additional resources for screening and monitoring customers. Second,

since banks can expect a shorter duration of bank relationships in a competitive environment, they are likely to reduce relationship-building activities, which inhibit the reusability and value of information (Chan, Greenbaum, and Thakor, 1986).

Alexakis, *et al*. (1995) examined the liberalization and profitability of the Greek commercial banks during the years 1989-1991. Results suggested that the determinants of profitability of Greek commercial banks were very different from those depicted in other countries during the periods of intense regulation in Greece.

Finance and Economic Development

Maddison (1970) made the distinction between the two terms in this sense when he writes: "The raising of income levels is generally called economic growth in rich countries and in poor ones it is called economic development". But this view does not specify the underlying forces which raise the income levels in the two types of economies. Hicks (1957) pointed out in this connection that the problems of underdeveloped countries are concerned with the development of unused resources, even though their uses are well-known, while those of advanced countries are related to growth, most of their resources being already known and developed to a considerable extent.

In fact, the terms 'development' and 'growth' have nothing to do with the type of economy. The distinction between the two relates to the nature and causes of change. Schumpeter (1934) made the distinction clearer when he defined development as a discontinuous and spontaneous change in the stationary state which forever alters and displaces the equilibrium state previously existing; while growth is a gradual and steady change in the long run which comes about by a gradual increase in the rate of savings and population. This view of Schumpeter has been widely accepted and elaborated by the majority of economists. According to Kindleberger (1965) "Economic growth means more output, while economic development implies both more output and changes in the technical and institutional arrangement by which it is produced and distributed. Growth may well involve not only more output derived from greater amounts of inputs but also greater efficiency, i.e. an increase in output per unit of input. Development goes beyond this to imply changes in the composition of output and in the allocation of inputs by sectors". Friedmann (1972) defined growth as an expansion of the system in one or more dimensions without a change in its structure, and development as an innovative process leading to the structural transformation of social system.

Thus economic growth is related to a sustained increase in the country's per capita output or income accompanied by expansion in its

labour force, consumption, capital and volume of trade. On the other hand, economic development is a wider concept than economic growth. "It is taken to mean growth plus change". It is related to quantitative changes in economic wants, goods, incentives, institutions, productivity and knowledge or the "upward movement of the entire social system", according Myrdal (n.d.). It describes the underlying determinants of growth such as technological and structural changes. In fact, economic development embraces both growth and decline. An economy can grow but it may not develop because poverty, unemployment and inequalities may continue to persist due to the absence of technological and structural changes. But it is difficult to imagine development without economic growth in the absence of an increase in output per capita, particularly when population is growing rapidly.

The economic historians suggest that a number of innovations were important. The development of the limited liability corporate structure allowed proprietors to take risk without facing complete personal ruin if the venture failed. Banking corporations efficiently pooled the resources of a large number of savers, the more so as they developed into joint-stock ownership structures, as opposed to purely private ones Sykes (2003). It is in view of this assertion that markets for the trading of claims against future income flows (stock and bond markets) allowed the providers of capital to retain their wealth in a more liquid form, thus encouraging them to commit more capital to long-term ventures. In other words, the development of financial markets and institutions was an integral part of the industrial revolution. It remains a key facilitator of the growth we enjoy today.

Despite these apparent differences, some economists use these terms as synonyms. Lewis (1954) in his *The Theory of Economic Growth* writes that "most often we shall refer only to growth but occasionally for the sake of variety to progress or to development".

Theoretical Framework

Classical theories of economic growth attributed to Adam Smith whose monumental work contained elements of growth theory even though those were not developed into a formal or systematic theory as we now know most theories to be. Elements of this non-formalised classical theory of growth are also to be found in the writings of Ricardo and other classical economists such as Mills (Olofin, 2001). He also continued with the next to the classical theories of growth are what may be described as Marxian theories of capitalist development which focus on the motivating force behind the development of the so-called capitalist economies. They also analyse how the alternative of planned economic development may be brought about. Planners in most of the now defunct socialist world lay claim

to being guided by the principles of growth and development outlined in Karl Marx's *Das Kapital*, in drawing up their development plans.

Among other theories in growth economics is Schumpeter's (1911) theory of growth, which emphasises the importance of inflationary financing and innovations as the major factors which promote economic growth. There is also Rostow (1960) who outlines five-stages of development which are (i) the traditional society (ii) the pre-conditions for take-off (iii) the take-off (iv) the drive to maturity and (v) the age of mass consumption. There is also Leibenstein (1957) critical minimum effort theory. The emphasis of his theory of economic growth is on the need to stimulate income-raising or growth promoting factors in developing economies to some critical minimum level, without which such economies would remain trapped in vicious circle of low income, slow growth and under development. There is another variant of the critical minimum effort thesis which is the Big-Push theory of growth, propounded by Rosenstein (1961). This theory stresses the need for a large comprehensive programme, in the form of a high minimum amount of investment that would enable a developing economy overcome once and for all the obstacles to development.

It is often argued that IT advances played a substantial role in the recent speedup, but the extent of this contribution is difficult to determine in part because many other events occurred over the same time period. Some have examined differences across industries and found that the highest productivity gains have generally occurred in industries that tend to use IT intensively and those that manufacture IT equipment (Stiroh, 2001).

Porter (1985) explains that competitive advantage grows fundamentally out of the value a firm is able to create for its buyers that exceeds the firm's cost of creating it. In this sense, value is what buyers are willing to pay, and superior value stems from offering lower prices than competitive price for equivalent benefits or providing unique benefits that more than offset a higher price. To achieve sustainable profit, therefore, a firm needs sustainable advantage, in either cost or differentiation (Porter, 1980, 1985). Thus, there are two basic types of competitive advantage: cost leadership and differentiation. These two basic types of source of competitive advantage combined with the scope of the firm's activity lead to three known generic strategies – cost leadership, differentiation strategy and focus strategy – for achieving above – average performance in an industry.

Methodology

Sources of data

In this study, secondary data in the form of panels have been used. The data have been collected from the banks annual financial reports and Factbooks covering the period 2001 – 2011. The data comprises of net

profits, total assets, total equity, ATM machines and e-banking services of the selected commercial banks.

Sample size and sampling techniques

For the purpose of this research work, the sample used comprises of 11 selected commercial banks out of a total population of 21 commercial banks in Nigeria. Thus, compared to the population, the sample is a bit above fifty percent which makes it adequate for the purpose of drawing inferences with respect to the entire population of the 21 mega banks in the country.

The use of purposive/availability sampling techniques was relied upon in order to solicit information that was available on our variables of interest in this study which were purposively designed in our model. The nature of some of the variables we are looking for such as net profit, ICT, total asset, return on equity may not be comprehensively provided by all the banks. Consequently we relied on where we could source our target data.

Variables and Measurements

The variables captured in the model specified for this study were measured as follows;

Dependent variable

Bank Performance/Finance – this variable has often been measured using return on asset (ROA) and return on equity (ROE). return on asset is defined as net income after tax divided by total assets. This ratio is an indicator of managerial efficiency; it indicates how capable the management of the banks has been converting the banks assets into net earnings, while return on equity is measured as net income after tax divided by total equity capital. It measures the rate of return to the shareholder (Adegbaju and Olokoyo, 2008; Ahmad and Khababa, 1999; and Kim and Kim, 1997). However, in this study return on equity as a proxy on bank performance is used.

Independent variables

The explanatory variables in the model are also measured as follows:

i. Net profit. This was measured as profits realized by the bank after tax following the works of Adegbaju and Olokoyo, 2008; Ahmad and Khababa (1999) and Kim and Kim (1997) which also measures economic growth.
ii. ATM's this variable was measured by the number of ATM used by each bank (Agbada, 2008) and have bank performance. Other control variable are:

iii. E-banking services in order to show the level of e-banking application by each bank of the selected banks representing the ICT.

Method of Data Analysis

A panel-data set was analysed using the STATA econometric software version 9. In order to avoid any form of model misspecification adequate panel approaches have been followed in analysing the data set. According to Yaffee (2005) the Ordinary Least Squares (OLS), constant coefficients, fixed effects and random effects models are among the commonly used models in analysing panel data. Examples of these models are thus stated. According to Bruderl (2005) the OLS model (pooled-OLS) for panel data can be estimated as:

$$Y_{iT} = \beta_o + \beta_1 X_{it} + U_{it} \quad (1)$$

This estimate may have some elements of unobserved heterogeneity where the error term and an independent variable are correlated. To this end, there may be the need to exploit other models (Bruderl, 2005). As for the fixed-effects (error-components) model it is specified as:

$$Y_{iT} = \beta_1 X_{it} + V_{it} + E_{it} \quad (2)$$

In doing away with the problem of unobserved heterogeneity, the model conducts a form of within transformation which could be done by averaging equation 2 over time for each *i,* this is specified as:

$$\overline{y}_i = \beta_1 \overline{X_i} + V_i + E_{it} \quad (3)$$

Then equation 4 was obtained by subtracting equation (3) from equation (2) as follows:

$$y_{it} - y_i = \beta_1 (X_{it} - \overline{X_i}) + \overline{E_{it}} + E_{it} \quad (4)$$

According to Bruderl (2005) this kind of model allows for time-constant heterogeneity to be solved. However, Yaffee (2005) is of the view that the random effects model may be the most appropriate in running a panel data regression. The random effects model assumes the intercept is a random outcome variable, therefore the following specification was used to circumvent likely problems in the data-set:

$$Y_{it} = \beta_o + \beta_1 X_{it} + \beta_2 X_{2it} + e_{it} \quad (5)$$

$$\beta_o = \beta_1 + V_{it} \quad (6)$$

Therefore, the following equation was arrived at by having a model that has an intercept, that is a random effect. This is specified as:

$$y_{it} = \beta_o + \beta_1 X_{it} + \beta_2 X_{2it} + e_{it} + v_i \quad (7)$$

In this case, the fixed effects model has the distinct advantage of allowing for time-invariant variables to be used as independent variables (Yaffee, 2005). In trying to adopt the most suitable of all models for the panel data, the Hausman specification test was used to determine the use of any of these models. In essence, the STATA econometric package version 11 was used to run such test.

Model Specification

In trying to assess the impact of ICT on commercial banks performance in Nigeria, the following model has been used:

$BP = \beta_0 + \beta_1 Profit + \beta_2 ATM + \beta_3 ebserv + \mu$ _____ (8)

Where

BP = Bank performance
β_0 = Constant parameter
Profit = Profit after tax
ATM = ATM usability
ebserv = e-banking services
μ = Error term

Data Presentation and Analysis

In this section both descriptive and inferential analysis of the data are dealt with.

Table 4.1 presents a summary of the descriptive statistics for the five variables used in this study. The data was extracted from eleven Nigerian Commercial Banks over the period 2001 to 2011. The summary is presented in the form of mean, standard deviation, minimum and maximum.

Table 1:Summary of Descriptive Statistics

Variables	Observation	Mean	Std. Dev.	Min.	Max.
Shareholders Fund	121	1.61	2.71	-2.81	1.18
Net Profit	121	1.33	2.65	-2.81	9.62
ATM	121	129.27	196.6782	0	1090
E-banking	121	7.25	4.6193	3	23
Return on Equity	121	28.12	85.78	-41.11	525.67

Source: Author's Computation using STATA Version 9.1

The results in Table 1 shows that, for the period 2001 to 2011, the average value of total equity of the eleven selected commercial banks stood at 1.61, while minimum stood at -2.81 and the maximum 1.18.

The mean value of the net profit for the selected banks was 1.33, while -2.81 was the minimum and 9.62 was the maximum. The average value of return on equity was 28.12, while -41.11 was the minimum and 525.67 was the maximum. The average use of ATM machines stood at 129 machines per annum, while 0 was the minimum and maximum stood at 1,090 machines. The average use of various e-banking services stood at 7.25, while 3 was the minimum and 23 was the maximum.

Table 2 shows the results obtained from regression analysis.

Table 2:Regression Results

Dependent Variable: Return on Equity		
Independent Variables	Fixed Effects	Random Effects
Net profit	2.17	2.19
	(0.000)	(0.000)
ATM	0.017	-0.025
	(0.731)	(0.485)
E-banking services	-4.648	0.631
	(0.227)	(0748)
R^2	0.51	0.50
F	0.000	0.000
Std Error	24.29	16.24

Source: Author's Computation using STATA Version 9.1
Note: Figures in parentheses are t-values

Fixed effects model shows that, the two tail P-values test the hypothesis that each coefficient is different from 0. The null hypothesis is rejected at 5 % level of significance showing that one of the independent variables (net profit) has a significant positive influence on return on equity which is used as a proxy for bank performance. The fixed effects model shows that the variable net profit has a positive coefficient (2.17) and statistically significant at 1 % level. This finding indicates that an increase in bank's profits leads to increase in bank performance. This is obvious because an increase in profit can give room for re-investment thus leading to procurement of more assets. The coefficient (0.0171) for ATM's usability shows a positive influence on bank's performance but it is not statistically significant. This finding indicates that the use of ATM's does not influence commercial bank's performance in Nigeria. The coefficient (-4.648) related to various internet banking services provided by commercial bank is negative and not statistically significant. The finding indicates that increase in investments in those banking services does not significantly influence bank performance. One possible explanation for this is that e-banking gadgets are capital intensive projects which consume huge amount of capital.

Table 2 also presents the random effects regression. The coefficient (2.19) for net profit shows a positive influence on bank's performance, and it is statistically significant at 1 % level. This finding indicates that an increase in bank profitability leads to increase in bank performance. The coefficient (-0.025) for ATM's usability shows a negative influence on bank's performance but it is not statistically significant. The coefficient related to e-banking services (0.631) shows a positive influence on bank performance but it is not statistically significant. This indicates the e-banking services do not

influence bank performance. The R^2 value from Fixed Effects model shows 51 % variation of the bank's performance. The F statistics value in both models show that all the models are adequate at 1 % level of significance.

To decide between fixed and random effects we ran a Hausman test where the null hypothesis states that the preferred model is random against the alternative which says the preferred model is fixed. The results show that random effects model is appropriate since the p-value 0.2591 is not significant.

Discussion of Results

The main objective of this study is to examine the impact of information and communication technology (ICT) on the efficiency of selected commercial banks in Nigeria. In order to do that some important variables such as Net profit, ATM usability and e-banking services were regressed on return on equity.

The results from both fixed and random effects models show that the use of ICT in the banking industry does not improve performance of the selected banks. This finding is in line with the findings of Lin (2007), Stellar (2010), Acharya *et al*., (2008), Almazari (2011), and Khrawshi (2011). But the use of ICT does not improve return on assets. Nonetheless the findings may be useful for assessing the effects of ICT investments on bank's productivity. Presumably, if ICT investment increases bank profitability, the banks that invest the most in ICT will have superior efficiency at any point in time.

In order to choose between the two models since both shows similar results, Hausman specification test has been conducted. The findings from Hausman Specification Test reveal that random effects model is the most appropriate in this study.

Summary, Conclusions And Recommendations

Summary of Findings

The data used in this study were sampled from various banks annual financial reports and Factbooks. Hausman specification test was used to decide between fixed effects or random effects to be adopted for this study. The results of the test indicated that random effects model is appropriate for this study. The findings are summarised as follows:

a. Investment in information and communication technology (ICT) does not improve performance in the Nigerian Commercial Banks.
b. An increase in bank's profitability enhance commercial bank's performance in Nigeria.

c. The coefficient related to e-banking services (0.631) shows a positive influence on bank performance but it is not statistically significant.

Conclusion

On the basis of the findings of this study, the following conclusions are drawn: investment of ICT does not improve commercial banks performance in Nigeria. This finding confirm the reality that most of the Nigeria's commercial banks are in financial distress since consolidation. In addition, profits serve as driving factor for commercial banks performance in Nigeria but the best measures of performance are return on equity and return on assets.

Recommendations

On the basis of the finding of this study, the following recommendations are offered:

i. since the findings of this study indicate that investment in ICT does not enhance Nigerian commercial banks performance, banks should give emphasis on efficient utilisation of the ICT equipment such as credit and electronic cards to pay at retail outlets, points of sales (POS), phone banking, electronic payment debit, cash withdrawal machines that becomes Automated Teller Machines (ATM), home banking, internet banking, mobile banking, personal digital assistant banking rather than purchase of new ones; and
ii. for banks to actually reap the benefit of ICT more campaigns and orientation of clients need to be pursued to create awareness on them to patronise the facilities. Acceptance of these facilities will consolidate the gains from investing on them.
iii. unlike the usual assumption that profitability is the measure for performance, firms should now go for either ROA or ROE because they are the best measures of performance.

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APPENDICES

```
      ___  ____  ____  ____  ____ tm
 /__    /   ____/   /   ____/
___/   /   /___/   /   /___/    9.1   Copyright 1984-2005
  Statistics/Data Analysis            StataCorp
                                      4905 Lakeway Drive
                                      College  Station,  Texas  77845
USA
                                      800-STATA-PC
http://www.stata.com
                                      979-696-4600
stata@stata.com
                                      979-696-4601 (fax)

40-student Stata for Windows (network) perpetual license:
       Serial number:  1990515882
         Licensed to:  SED Facoltà di Economia
                       Università Tor Vergata
Notes:
1.  (/m# option or -set memory-) 1.00 MB allocated to data

. edit
(8 vars, 121 obs pasted into editor)
. run "C:\DOCUME~1\user2\LOCALS~1\Temp\STD09000000.tmp"
. browse

.  log  using  "C:\Documents  and  Settings\user2\My  Documents\Stata
9.1\aaaaaa.smcl"
-------------------------------------------------------------------
log:       C:\Documents    and    Settings\user2\My    Documents\Stata
9.1\aaaaaa.smcl
  log type:  smcl
 opened on:  23 Nov 2012, 11:01:57

. summarize shfund netprof atm ebserv roe
Variable |     Obs     Mean       Std. Dev.   Min          Max
-------------+--------------------------------------------------------
      shfund | 121    1.61e+08    2.71e+08  -2.81e+08   1.18e+09
     netprof | 121    1.33e+08    2.65e+08  -2.81e+08   9.62e+08
         atm | 121    129.2727    196.6782          0       1090
      ebserv | 121    7.247934    4.619309          3         23
         roe | 121    28.12483    85.75849  -41.11396   525.6674

xtset id year
       panel variable:  id (strongly balanced)
        time variable:  year, 2001 to 2011
                delta:  1 unit
.
. xtreg roe pat atm ebserv, re
```

```
Random-effects GLS regression     Number of obs      =       121
Group variable: id                Number of groups   =        11

R-sq:  within  = 0.4974           Obs per group: min =        11
       between = 0.5257                          avg =      11.0
       overall = 0.5025                          max =        11

Random effects u_i ~ Gaussian      Wald chi2(3)       =    115.66
corr(u_i, X)       = 0 (assumed)   Prob > chi2        =    0.0000

------------------------------------------------------------------------------
         roe |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pat |   2.19e-07   2.18e-08    10.02   0.000     1.76e-07    2.61e-07
         atm |  -.0254275   .0363892    -0.70   0.485    -.0967491    .0458941
      ebserv |   .6310353   1.967128     0.32   0.748    -3.224464    4.486535
       _cons |   5.255632   16.23958     0.32   0.746    -26.57337    37.08463
-------------+----------------------------------------------------------------
     sigma_u |  25.263062
     sigma_e |  58.096311
         rho |   .1590227   (fraction of variance due to u_i)
------------------------------------------------------------------------------
. xtreg roe pat atm ebserv, fe

Fixed-effects (within) regression  Number of obs      =       121
Group variable: id                 Number of groups   =        11
R-sq:  within  = 0.5063            Obs per group: min =        11
       between = 0.2006                           avg =      11.0
       overall = 0.4169                           max =        11
                                   F(4,106)           =     27.18
corr(u_i, Xb)  = -0.2713           Prob > F           =    0.0000

------------------------------------------------------------------------------
         roe |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pat |   2.17e-07   2.27e-08     9.57   0.000     1.72e-07    2.62e-07
         atm |   .0171377   .0497691     0.34   0.731    -.0815343    .1158098
      ebserv |  -4.648265   3.822842    -1.22   0.227    -12.22742    2.930893
       _cons |    36.7172   24.28612     1.51   0.134    -11.43238    84.86679
-------------+----------------------------------------------------------------
     sigma_u |  39.236211
     sigma_e |  58.096311
         rho |  .31324236   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:   F(10, 106) = 2.31   Prob > F = 0.0168
. estimates store fixed
. xtreg roe pat atm eserv, re
variable eserv not found
r(111);
. xtreg roe pat atm ebserv, re

Random-effects GLS regression      Number of obs      =       121
```

```
Group variable: id                Number of groups   =        11

R-sq:  within  = 0.4974           Obs per group: min =        11
       between = 0.5257                          avg =      11.0
       overall = 0.5025                          max =        11

Random effects u_i ~ Gaussian     Wald chi2(3)       =    115.66
corr(u_i, X)       = 0 (assumed)  Prob > chi2        =    0.0000

------------------------------------------------------------------------------
         roe |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         pat |   2.19e-07   2.18e-08    10.02   0.000     1.76e-07    2.61e-07
         atm |  -.0254275   .0363892    -0.70   0.485    -.0967491    .0458941
      ebserv |   .6310353   1.967128     0.32   0.748    -3.224464    4.486535
       _cons |   5.255632   16.23958     0.32   0.746    -26.57337    37.08463
-------------+----------------------------------------------------------------
     sigma_u |  25.263062
     sigma_e |  58.096311
         rho |   .1590227   (fraction of variance due to u_i)
------------------------------------------------------------------------------

. estimates store random
. hausman fixed, sigmamore

Note: the rank of the differenced variance matrix (2) does not equal
the number of coefficients being tested (3); be sure this is what
you expect, or there may be problems computing the test.  Examine
the output of your estimators for anything unexpected and possibly
consider scaling your variables so that the coefficients are on a
similar scale.

                 ---- Coefficients ----
    |  (b)          (B)             (b-B)    sqrt(diag(V_b-V_B))
    | fixed        random        Difference        S.E.
-------------+----------------------------------------------------
pat |2.17e-07      2.19e-07       -1.95e-09      5.73e-09
atm |.0171377      -.0254275        .0425652      .0336754
ebserv|-4.648265    .6310353      -5.2793        3.260967
------------------------------------------------------------------
            b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained
from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(2) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =        2.70
                Prob>chi2 =        0.2591
```

LIST OF SELECTED COMMERCIAL BANKS

BANK	B_ID	Year					
			SF	PAT	ATM	ebserv	ROE
ACCESS	1	2001	919493000.00	77743000.00	0.00	5.00	0.08455
ACCESS	1	2002	1343704.00	-55245000.00	0	5	-41.114
ACCESS	1	2003	2365356.00	556573000.00	0	5	235.302
ACCESS	1	2004	2702830.00	637473000.00	0	5	235.8539
ACCESS	1	2005	14071324.00	501515000.00	0	6	35.64092
ACCESS	1	2006	28893886.00	737149000.00	34	6	25.51228
ACCESS	1	2007	28384891.00	6083439.00	71	6	0.21432
ACCESS	1	2008	171860665.00	16056464.00	95	7	0.093427
ACCESS	1	2009	185188124.00	20814216.00	154	7	0.112395
ACCESS	1	2010	175370457.00	11068121.00	190	7	0.063113
ACCESS	1	2011	197042209.00	16708255.00	305	9	0.084795
DIAMOND	2	2001	47372580.00	1689618.00	25	4	0.035667
DIAMOND	2	2002	53003546.00	1478175.00	28	4	0.027888
DIAMOND	2	2003	115263000.00	65776000.00	35	4	0.57066
DIAMOND	2	2004	883414000.00	903411000.00	41	4	1.022636
DIAMOND	2	2005	2510279.00	2509810.00	50	4	0.999813
DIAMOND	2	2006	222833154.00	3977059.00	150	4	0.017848
DIAMOND	2	2007	320419399.00	7086770.00	164	4	0.022117
DIAMOND	2	2008	625669618.00	12821074.00	165	4	0.020492
DIAMOND	2	2009	650757117.00	-8174413.00	180	4	-0.01256
DIAMOND	2	2010	6522455.00	548402560.00	180	4	84.07916
DIAMOND	2	2011	-22187848.00	722965977.00	180	4	-32.5839
ECO	3	2001	2522540.00	716071000.00	0	4	283.869
ECO	3	2002	2945733.00	553725000.00	0	4	187.9753
ECO	3	2003	3518887.00	816815000.00	0	4	232.1231
ECO	3	2004	4413327.00	854439000.00	0	4	193.6043
ECO	3	2005	25762863.00	1368174.00	0	4	0.053106
ECO	3	2006	132091706.00	3558591.00	52	4	0.02694
ECO	3	2007	311395894.00	7449777.00	104	4	0.023924
ECO	3	2008	432466245.00	2130461.00	163	4	0.004926
ECO	3	2009	355662000.00	-4588000.00	185	4	-0.0129
ECO	3	2010	206817600.00	21091040.00	191	4	0.101979
ECO	3	2011	233493760.00	33094400.00	191	4	0.141736

BANK	B_ID	Year					
			SF	PAT	ATM	ebserv	ROE
FIDELITY	4	2001	1300533.00	400661000.00	0	8	308.0745
FIDELITY	4	2002	1915211.00	539242000.00	0	10	281.5575
FIDELITY	4	2003	2515423.00	856885000.00	0	10	340.6524
FIDELITY	4	2004	3519624.00	913604000.00	0	10	259.5743
FIDELITY	4	2005	9776922.00	1305854.00	0	10	0.133565
FIDELITY	4	2006	25664717.00	3218617.00	32	10	0.12541
FIDELITY	4	2007	30101287.00	4714283.00	56	12	0.156614
FIDELITY	4	2008	136371740.00	13356301.00	89	14	0.09794
FIDELITY	4	2009	435666000.00	1557000.00	112	15	0.003574
FIDELITY	4	2010	154371740.00	14256301.00	134	18	0.09235
FIDELITY	4	2011	165371740.00	15356421.00	168	18	0.09286
FIRST	5	2001	18170000.00	5066000.00	50	5	0.278811
FIRST	5	2002	19406000.00	4776000.00	65	5	0.246109
FIRST	5	2003	27006000.00	11010000.00	73	6	0.407687
FIRST	5	2004	41605000.00	11483000.00	104	8	0.276
FIRST	5	2005	48726000.00	13234000.00	280	10	0.2716
FIRST	5	2006	64277000.00	17383000.00	650	10	0.270439
FIRST	5	2007	83627000.00	20636000.00	729	10	0.246762
FIRST	5	2008	351854000.00	36679000.00	818	10	0.104245
FIRST	5	2009	337405000.00	12569000.00	904	10	0.037252
FIRST	5	2010	32123000.00	1962444.00	1090	16	0.061092
FIRST	5	2011	47462000.00	2463543.00	1090	16	0.051906
GTBANK	6	2001	4026177.00	1503694.00	15	13	0.373479
GTBANK	6	2002	8016492.00	2187059.00	23	13	0.27282
GTBANK	6	2003	9638925.00	3144182.00	26	15	0.326196
GTBANK	6	2004	11754406.00	4125832.00	35	15	0.351003
GTBANK	6	2005	33643184.00	5433748.00	60	17	0.161511
GTBANK	6	2006	40549833.00	8590265.00	160	18	0.211845
GTBANK	6	2007	47324118.00	13193759.00	170	18	0.278796
GTBANK	6	2008	160008886.00	21169477.00	185	20	0.132302
GTBANK	6	2009	1065504345.00	23687567.00	200	21	0.022231
GTBANK	6	2010	1125505445.00	27685776.00	215	23	0.024599
GTBANK	6	2011	1175503454.00	32685776.00	218	23	0.027806
STERLING	7	2001	531563000.00	370038000.00	0	4	0.696132

BANK	B_ID	Year					
			SF	PAT	ATM	ebserv	ROE
STERLING	7	2002	664454000.00	39810000.00	0	4	0.059914
STERLING	7	2003	831688000.00	178923000.00	0	4	0.215132
STERLING	7	2004	1243294.00	1545077.00	0	4	1.242729
STERLING	7	2005	2966726.00	-4820558.00	0	4	-1.62487
STERLING	7	2006	26319328.00	961645000.00	45	4	36.5376
STERLING	7	2007	26800395.00	620658000.00	50	6	23.15854
STERLING	7	2008	6523153.00	236502923.00	55	6	36.25592
STERLING	7	2009	-6660406.00	205640827.00	60	6	-30.8751
STERLING	7	2010	4178493.00	259579523.00	68	6	62.12276
STERLING	7	2011	6686473.00	504427737.00	68	6	75.44003
UNION	8	2001	13786000.00	5035000.00	0	4	0.365226
UNION	8	2002	30302000.00	4726000.00	0	4	0.155963
UNION	8	2003	32730000.00	6600000.00	0	4	0.20165
UNION	8	2004	39732000.00	8341000.00	0	4	0.209932
UNION	8	2005	43215000.00	9783000.00	0	7	0.22638
UNION	8	2006	100500000.00	10802000.00	35	7	0.107483
UNION	8	2007	102706000.00	13329000.00	56	7	0.129778
UNION	8	2008	25739000.00	26855000.00	83	7	1.043358
UNION	8	2009	-281173000.00	-281373000.00	190	7	1.000711
UNION	8	2010	-135894000.00	118016000.00	198	7	-0.86844
UNION	8	2011	301173000.00	301173000.00	204	7	1
UBA	9	2001	9067000.00	1269000.00	15	3	0.139958
UBA	9	2002	10627000.00	1566000.00	23	3	0.14736
UBA	9	2003	14901000.00	3280000.00	32	3	0.220119
UBA	9	2004	19533000.00	4525000.00	32	3	0.231659
UBA	9	2005	19443000.00	4921000.00	42	4	0.253099
UBA	9	2006	48535000.00	11550000.00	83	4	0.237973
UBA	9	2007	167719000.00	21441000.00	112	4	0.127839
UBA	9	2008	1673333.00	40825000.00	142	4	24.39742
UBA	9	2009	1548281.00	2375000.00	182	4	1.533959
UBA	9	2010	2167000.00	1432632.00	253	4	0.661113
UBA	9	2011	-16385000.00	1655465.00	340	4	-0.10104
WEMA	10	2001	619554000.00	675015000.00	0	4	1.089518

BANK	B_ID	Year					
			SF	PAT	ATM	ebserv	ROE
WEMA	10	2002	1481667.00	778864000.00	0	4	525.6674
WEMA	10	2003	1477775.00	1527311.00	0	4	1.033521
WEMA	10	2004	967148000.00	1555460.00	0	4	0.001608
WEMA	10	2005	844285000.00	4451625.00	0	6	0.005273
WEMA	10	2006	20540001.00	-6601961.00	120	6	-0.32142
WEMA	10	2007	25182705.00	2554098.00	150	6	0.101423
WEMA	10	2008	128906575.00	-57738739.00	150	6	-0.44791
WEMA	10	2009	142785723.00	-2094692.00	160	6	-0.01467
WEMA	10	2010	203144627.00	16238533.00	168	6	0.079936
WEMA	10	2011	210144627.00	16538533.00	168	6	0.078701
ZENITH	11	2001	2418243.00	1026658.00	25	5	0.424547
ZENITH	11	2002	3504013.00	1026658.00	32	5	0.292995
ZENITH	11	2003	4424186.00	1548555.00	53	5	0.35002
ZENITH	11	2004	5190768.00	1548555.00	67	5	0.298329
ZENITH	11	2005	42100031.00	7143266.00	84	5	0.169674
ZENITH	11	2006	100642511.00	11619227.00	102	7	0.11545
ZENITH	11	2007	114586090.00	18779804.00	123	7	0.163893
ZENITH	11	2008	344348245.00	51992239.00	245	7	0.150987
ZENITH	11	2009	335570000.00	20603000.00	267	7	0.061397
ZENITH	11	2010	350414000.00	33335000.00	303	7	0.09513
ZENITH	11	2011	360868000.00	37414000.00	373	7	0.103678