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IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGY ON THE PERFORMANCE OF DEPOSIT MONEY BANKS IN NIGERIA

Nwakoby Nkiru Peace[1]
Charity Philip Sidi[2]
Ofobruku Sylvester Abomeh[3+]

[1]*Entrepreneurship Studies Unit, Nnamdi Azikiwe University, Akwa, Anambra State, Nigeria*
Email: nwakobyn@yahoo.co.uk Tel: +2348036286494
[2]*Department of Economics, Kaduna State College of Education, Nigeria*
Email: charitysidi2@gmail.com Tel: +2347034596710
[3]*Faculty of Humanities, Social and Management Sciences, Edwin Clark University, Kiagbodo, Delta State, Nigeria*
Email: ufomaeliz@yahoo.com Tel: +234836000624

(+ Corresponding author)

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ABSTRACT

The study examines the impact of information and communication technology on the performance of deposit money banks in Nigeria between the periods 2006 to 2015. The log-linear regression model was used to test the impact of various forms of information and communication technology on the banks return on equity (ROE), the computation of the result was done using the econometric computer software package, e-view version 8.0. The result shows that the adoption of various forms of information and communication technology has greatly influenced the quality of banking operations, performance and has specifically increased banks return on equity. Information and communication technology usage can sustain returns on equity of deposit money banks in the long run. The study recommends that investment in information and communication technology should form an important component in the overall strategy of banking operation, as these will make Nigerian banks to be more efficient, profitable, and competitive.

Contribution/Originality: This study contributes to the existing literature that investigated the use of ICT in Nigeria banks'. Currently there is the paucity of studies in Nigeria that examines the interbank transactions with the aid of ICT. This study contributes an important dimension in the search for better performance of Nigeria banks.

1. INTRODUCTION

The need for efficiency and effectiveness in the running of the Banks as leading players in the cohort of financial services providers of a nation thus cannot be overemphasized (Binugo and Aregbeshola, 2014). Before the coming of information technology, the transaction of businesses especially in the financial sector was difficult and stressful; hence, the low performance level of banks in Nigeria. Technology has indeed influenced the performance of all Nigerian Banks in the last decade. This period has been associated with the provision of dynamic customers focused on banking services, improved regulation and high profitability. Binugo and Aregbeshola (2014) assert that recent advances in the technological world giving birth to the emergence of information and communication technology (ICT) have led to remarkable changes in the ways businesses are run in contemporary times. This development is underscored by contemporary advancements engineered by the knowledge economy. It is also important to state that modern banking in Nigeria is driven by the outputs from robust local and global research

and development. It is in an effort to establish the prevailing trend in the adoption of ICTs in the operations of Nigerian commercial banks that the researcher has chosen this topic.

The study is structured into five sections with the foregoing introduction, statement of the problem, research questions and objectives serving as section one. Section two of the study presents a review of the literature (conceptual and theoretical frameworks) including the empirical literature on the subject matter; section three focuses on the research methodology and models specification to test the hypothesis. Section four embodied the data presentations and discussion of findings. The paper concludes in section five with the conclusions, summary of findings and policy recommendations

1.1. Statement of the Problem

Despite the rapid growing adoption of the information technology tools to improve banking operations through the use of SMS, Internet, online banking and real time gross settlement, Nigerian banks are still facing the challenges of continually modernise their operations so as to increase their productivity, enhance quality of service delivery and also minimise the average operating cost and time. Thus the study intends to fill the existing gap by taking a critical look on the effective use of technology in Nigerian banks, with a view to establishing the link between the adoption of selected ICT tools and their impact on the performance of commercial banks in Nigeria. The study uses an empirical study of the trend across banks from the period 2006 to 2015. The study also contributes to the knowledge of customers who use ICT tools for their operation. It informs the customers of the most effective and efficient technology in the banks that may be attractive to them.

1.2. Research Questions

The study sought to provide answers to the following question:

i. What is the impact of ATM, POS, MM, WP and IBT on return on equity (ROE) of commercial banks in Nigeria?

1.3. Research Objectives

The main objective of the study is to evaluate the impact of Information and Communication Technology on the performance of commercial banks in Nigeria from 2006 to 2015. Specifically, the study sought to do the following:

i. To know if the use of ATM, POS, MM, WP and IBT in financial institutions have long run equilibrium and lead to a significant impact on ROE of commercial banks in Nigeria.

2. LITERATURE REVIEW

2.1. The concept of Commercial Banks

In a bit to conceptualize the commercial banks, the concept of the banking industry in general has to be taken into consideration. The financial institution in Nigeria is categorized into two namely, the depository bank and non-depository banks, The commercial banks basically falls under the depository banks or the deposit money banks, though its performs various functions as the opening of account where depositors (surplus unit) make payment into their account for safe keeping and this deposit is given out as loans to interested customers (deficit unit) who seek for such loans for investment purposes. A financial institution licensed by the regulatory authority to mobilize deposits from the surplus unit and channel the funds through loans to the deficit unit and performs other financial services activities. According to Investopedia (2017) commercial bank is a financial institution that provides various financial services, such as accepting deposits and issuing loans. Commercial bank customers can take advantage of a range of investment products that commercial banks offer like savings accounts and certificates of deposit. The loans a commercial bank issues can vary from business loans and auto loans to mortgages.

CBN (2016) further reiterates that commercial banking business in an economy consisting of changing cash for bank deposit and bank deposit for cash transferring same from one person or corporation to another, giving bank deposit in exchange for a bill of exchange, government bonds, the secured or unsecured promise of business to repay. This concept of banking portrays the underlying fact that bank as an organization principally is concerned with the accumulation of temporarily idle money of the general public purposely for advancing same to others for expenditure.

The study captures basically the deposit aspect of the commercial banks and interbank transaction with the aid of the ICT tools.

2.2. The Concept of Information and Communication Technology

Information and communication technology simply refers to as the gathering, storing, manipulating and transferring information. It is the automation of the process, controls and information production using computers, telecommunication, software and ancillary equipment such as Automated Teller Machine and Debit Cards. It is a term that generally covers the harnessing of electronic technology for the information needs of a business at all levels. ICT deals with the physical devices and software that link various computer hardware components and transfer data from one physical location to another. Roger (2016) opined that ICT is a synergy between computers and communication devices and forms an important part of the modern world. Thus the most significant shortcomings in the banking industry today is a wide spread failure on the part of senior management in banks to grasp the improvement of technology and incorporate it into their strategic plans. Yousafzai (2012) asserts that ICT Banking adoption is a complex and multifaceted process and joint consideration of customers' personal, social, psychological, utilitarian and behavioural aspects is more important than adoption itself and will ultimately result in the intended behaviour. It is imperative that all these innovations aimed at having a competitive edge are related to the profitability of banks (Akombo, 2011).

2.3. THEORETICAL FRAMEWORK

Contingency theory suggests that an information system should be designed in a flexible manner so as to consider the environment and organizational structure confronting an organization. Information systems also need to be adapting to the specific decisions being considered. In other words, information systems need to be designed within an adaptive framework. Review of accounting information system literature also indicates that most AIS studies have incorporated contingency factors such as organizational structure, business strategy, and environmental condition in their research model but have neglected the influence of IT on AIS design. According to Lamminen *et al.* (2015) contingency approach assert that neither the type of strategy, nor the organizational configuration will directly affect performance. Rather, contingency theory suggests that the most important determinant of performance is the contingent fit between the chosen strategy and its contextual variables.

Similar to IT researches, these studies viewed IT from the technological perspective only but failed to incorporate other perspectives of IT sophistication such as informational, functional and managerial. Hunton and Flowers (1997) suggested that a more comprehensive AIS study is needed to explain the relationship between IT and accounting and its subsequent impact on the organization in general and accounting/accountants in particular. Very few of such studies have been carried out in developing countries especially in the Middle East. Due to the continuous flow of considerable amount of empirical studies which investigate the contingency factors and accounting and/or IS and indicates the importance and vitality of this theory, this study is theoretically and empirically constituted upon contingency theory which has long been applied in both accounting and information system disciplines. Ikpefan and Agwu (2015) opined that there is an imperative need for not mere technology upgrading but also its integration with the general way of functioning of banks to give them an edge in respect of services provided to optimizing the use of funds.

2.4. EMPIRICAL LITERATURE

Dabwor *et al.* (2017) studied the effect of ICT adoption on the competitive performance of banks in an emerging economy: The Nigerian experience. The study adopted both inferential and descriptive design using a t-test, the findings of the study revealed that a positive relationship exists between ICT and banks performance in Nigeria. This implies that a marginal change in the level of the investment and adoption of ICT such as (Automated teller machine, Web based transactions, and Mobile payments) in the banking industry resulted in a proportionate increase in the profit level. The study recommends that it is paramount for bank management to intensify investment in ICT products to facilitate speed, convenience, and accurate service delivery. In the same vein (Olatokun and Igbinedon, 2010) in their study observed that there has been increased deployment of ATMs by banks in Nigeria; while only one bank had the ATM in 1998 this had increased to 14 in 2004. Between the beginning of the year 2005 and March 2006 debit card transactions increased from 1, 065,972 in 2004 to144, 448,615 between January 2005 to march 2006.

Wilson *et al.* (2014) examine the impact of Information and communication technology on bank profitability, they used a sample comprising one-quarter of the banks in Nigeria quoted on the Nigeria stock exchange. The study adopted the OLS regression techniques, it was found that the regression result was in conflict with the aprori expectations, which indicates that IT spending in the study period had no significant impact on future operating performance. However, the study further concludes on the findings of the result which shows that technology investment is inevitable for banking institutions to enable them to continue to operate efficiently in the current competitive banking industry.

In 2014, Ahmed examines the effect of its investment on productivity and profitability by analyzing data from the Arab banks. The result of the study indicate that there are substantial returns due to an increase in investment in IT capital, a fact which incentivizes the bank's management to shift its emphasis in IT investment from labor to capital

Oyinkola (2018) conducted a study on the impact of Information technology on banking operations in the First bank of Nigeria PLC. The data used was primary data and the research instruments used are questionnaires and personal interview for staff and customer of the bank. Simple frequency percentage was adopted as the statistical and the hypothesis was analyzed using Chi-square. The result revealed that IT has greatly improved the growth and performance of Nigerian commercial banks and has led to increased customers satisfaction. The study recommends government support to improve local IT firms to foster importation, the lower tariff on the importation of IT related equipment and their agencies and regulatory bodies to upgrade their equipment as well.

Furthermore, Luka and Frank (2012) in their work, "The impact of ICTs on banks: A Case study of the Nigerian Banking Industry", collected data via questionnaires from customers in the selected banks. Guaranty Trust Bank plc, First Bank of Nigeria plc, Zenith Bank international and United Bank for Africa (UBA). The response were measured with a 5 pointer likert - type rating, where strongly agree (SA) = 5; Agree (A) = 4; Neutral (N) = 3; Disagree = 2; Strongly Disagree = 1. The results of the research indicated that investment in the ICT system and infrastructures has become a key element in productivity and growth in the banking industry

A study conducted by Madueme (2010) on the impact of ICT on banking efficiency in Nigeria using a survey of 13 banks. The findings are based on the CAMEL rating and a transcendental logarithmic function of the banks, conclusions were made on the efficient values obtained through the CAMEL rating system were higher during post adoption era than before adoption and estimated that a 1% increase in ICT capital on average leads to 0.9185 Naira increase in bank output post ICT adoption era.

In order to determine the factors influencing customer's choice of banks in Nigeria, Maiyaki and Mokhtar (2010) evaluate the effect of availability of electronic banking facilities among others. The study adopted a survey study of 407 banks customers in 33 private and public organizations in Kano in the Northern part of the country, they found that the availability of electronic banking facilities such as ATM, online banking and telephone banking

do not have a significant influence on customers banks choice decision. This result was rationalized on the ground that ICTs have become widely diffused in the Nigerian banking sector that is all firms in the industry have embraced the ICT ideology.

Oluwagbemi *et al.* (2011) in their study on the impact of information in Nigeria banking industry, they adopted a qualitative method. In their findings it was revealed that the deployment of IT facilities in the Nigerian banking industry has brought about fundamental changes in the content and quality of banking business in the country. They conclude that Nigeria banks have been rapidly transformed from being just a bank to a one-stop shop financial solution provider. The study further recommends that there should be M-Commerce implementation in Nigeria based on the rate of growth and diffusion of mobile devices.

Binugo and Aregbeshola (2014) their study assess the impact of ICT on commercial bank performance in South Africa. The analysis of the data was done using the panel environment using the orthogonal transformation approach. The finding of the study indicates that the use of ICT increases the return on capital employed as well as the return on assets of the South African banking industry. The study recommends that banks emphasize policies that will enhance proper utilization of ICT equipment rather than additional investment.

2.5. IMPACT OF INFORMATION TECHNOLOGY IN NIGERIA BANKS

Information technology has become a key element in the economic development of Nigeria and indeed the banking industry in general. Balogun (2016) also confirms that ICT is a concept that is having a remarkable effect on almost entire aspects of the human endeavours. Developing countries are increasingly being faced with the challenges of technological advancement and the constant proliferation of technologies. As part of the developmental process IT driven businesses, globally are growing in leaps and bounds for example the e-business, e-commerce, e-finance, e-banking etc. Information and Communication Technology have contributed to the distribution channels and networking of Nigerian Banks. The electronic delivery channels are collectively referred to as Electronic banking. E-banking is really not one technology but an attempt to merge several different technologies. Balogun (2016) also affirms that ICT involves the application of principles to engage physical component in processing, distributing, producing, transforming information to achieving an intended goal. ICT gadget includes telecoms, TV and Radio broadcasting, hardware and software, computer services and electronic media. The convergence of computer and Telecommunication after about four decades of applying computers to routine data processing, mainly in information storage and retrieval, has created a new development where information has become the engine of growth around the world. This development has created catch-up opp (Balogun, 2016).

Information Technology affects financial institutions by easing enquiry, saving time and improving service delivery. In recent decades, investment in IT by commercial banks has served to streamline operations, improve competitiveness and increase the variety and quality of services provided. According to Ukah (2013) Nigerian banking industry has become highly ICT-based and is reaping the benefits of a technological revolution as evidenced by its application in most of its operations. Many commercial banks are making huge investments in technology to maintain and upgrade their infrastructure, in order not only to provide new electronic information-based service, but also to take timely advantage of new off-the-shelf electronic services such as online retail banking which is making it possible for very small institutions to take advantage of new technologies at quite reasonable costs. These developments may ultimately change the competitive landscape in the financial services market.

Information and Communication Technology (ICT) facilitate the networking of commercial bank branches and to other banks within and outside the nation. Computerization and inter-connection of geographically scattered stand-along bank branches and other banks at national and global levels into one unified system in the form of a wide area network (WAN) or enterprise network (EN); for the creating and sharing of consolidated customer information or records. It offers a quicker rate of inter-branch transactions as the consequence of distance and time

are eliminated. Hence, there is more productivity per time period. Also, with the several networked branches serving the customer populace as one system, there is a simulated division of labour among bank branches with its associated positive impact on productivity among the branches. Furthermore, the information sharing infrastructure put in place by the banks curtails customers travel distance to bank branches thereby providing more time for customers' productive activities.

In Nigeria, ICT usage especially in the banking sector, has considerably improved, even though it may not have been as high as those observed for advanced countries. Information and communication technology has provided self-service facilities (automated customer service machines) from where prospective bank customers can complete their account opening documents directly online. Furzaneh (2012) in their research say that customers are encouraged to utilize ICT banking as first priority. Increasing the customer's arousal by ICT advertisements to use ICT banking creates a positive attitude toward the bank's brand, which in-turn is the key factors in ICT banking effectiveness. It assists the customer to validate their account numbers and receive instruction on when and how to receive their cheque books, credit and debit cards

The Global System Mobile (GSM), the mobile banking service basically allows customers to operate their accounts online. It offers retail banking services to customers at their offices/homes as an alternative to going to the bank branch/ATM. This saves customers time, and gives more convenience for higher productivity.

The Automated Teller Machine (ATM) is a combination of a computer terminals, record keeping system and cash vault in one unit, permitting customers to enter the bank's book keeping system with a plastic card containing a Personal Identification Number (PIN). The ATM work for 24 hrs. The bank monitors and loads cash when it is out of cash. Apart from serving cash withdrawal purposes, the same ATM can also accept deposits. ATMs are a cost–efficient way of yielding higher productivity as they achieve higher productivity per period of time than human Tellers; it saves customer's time in terms of service delivery as an alternative to queuing in bank halls.

Electronic Funds Transfer is an on-line system that allows customers to transfer funds instantaneously from their bank accounts to merchant accounts when making purchases (at purchase point). A POS uses a debit card to activate an Electronic Fund transfer process (Chorafas, 1988). Increased banking productivity results from the use of EFT POS to service customers shopping payment requirements instead of clerical duties in handling cheques and cash withdrawals during banking hours, hence continual productivity and accrual to the bank even after banking hours. It saves customers invaluable time and energy in getting to bank branches or ATMs for cash withdrawals and this can be harnessed into other productive activities. Information technology has afforded customers and service providers the opportunity of paying bills and performing transactions of any kind electronically. Electronic payment can be credited and debited the same day customers can also make payments for goods and services without necessarily having physical contact with the cash. The Banks can send customer's statement of account, enquiries, promos, and the request of any kind is carried out via the electronic mailing facility.

3. RESEARCH METHODOLOGY

3.1. The Data

Data used for this study were collected basically from secondary sources such as Nigeria Bureau of statistics CBN annual report and Statistical Bulletin, for the quarters of 2006 – 2015. In this study, data on ATM, POS, MM, WP and IBT were used to examine the impact of ICT on the commercial bank performance, measured by ROE.

For the purpose of this research, the researcher uses ordinary least square (OLS) multiple regression model to estimate the variables. This involves estimation of the model in order to examine the impact of ICT (proxies by ATM, POS, MM, WP, and IBT usages) on ROE in Nigeria. According to Rose and Hudgins (2006) found ROE as a better proxy for measuring bank performance.

The log-linear regression model was used to test the impact of ATM, POS, MM, WP and IBT were used to examine the effect of ICT on commercial bank performance, ROE. The conversion of parameters into logarithm

aims at achieving unique parameter estimates that would enable us to interpret the regression coefficients in terms of elasticity and consequently give a slightly better fit. To capture both the long-run and the short-run dynamics of ATM, POS, MM, WP and IBT on ROE, an error correction model (ECM) using the Johansen and Juselius (1990) multivariate co-integration techniques were also employed. The computation of the result was done using the econometric computer software package, E-views version 8.0. The research design adopted for this work is the experimental research design. The reason is that experimental research design combines the theoretical consideration with empirical observation.

BOX-1. Description of Variables

Variables	Category of Variable	Description
Return on Equity (ROE)	Dependent Variable	Is a proxy on banks performance, measures how effectively a company has used the owner's resources (Anyanwuokoro, 2008). It is used as a measure of performance or profitability of the commercial banks
Automated Teller Machine (ATM)	Independent Variable	ATM is described in the study as the total value of ATM transactions in Nigeria. ATM = Total value of ATM transactions or usage by the number of people
Point of Sale (POS)	Independent Variable	POS is described as the total value of POS transactions in Nigeria. POS = Total value of POS transactions
Mobile Money (MM)	Independent Variable	MPAY is described as the total value of mobile payment transactions in Nigeria. MPAY = Total value of mobile payment transactions.
Web Payment (WP)	Independent Variable	WP is described as an online service that transfer funds from a customer to another. WP= Total value of web payment transactions
Interbank Transfer (IBT)	Independent Variable	IBT is described as electronic funds from the account of beneficiary maintained with any other bank branch. IBT= Total volume of interbank transfer.

3.2. The Structural Regression Model Specification

This section is preoccupied with the formulation of an appropriate model, which theoretically establishes the relationships between our ICT variables and commercial bank performance. For this purpose, the equation below have been formulated and simultaneously analyzed:

$$ROE = f(ATM, POS, MM, WP, IBT) --------1$$

$$ROE_t = \beta_0 + \beta_1 ATM_t + \beta_2 POS_t + \beta_3 MM_t + \beta_4 WP_t + \beta_5 IBT_t + \varepsilon_t \text{ ----------(2)}$$

Where:

ROE= Return on Equity

ATM = Automated teller machine

POS = Point of sale

MM = Mobile money

WP = Web payment

IBT = Interbank transfer

ε = other variables not explicitly included in the model.

T = Time period

B_0 = Constant Term of stocastic terms

β_1 to β_5 = Coefficient of explanatory variables of ATM,POS, MM,WP, IBT respectively

The coefficients $\beta_1, \beta_2, \beta_3, \beta_4 and \beta_5$ can be directly estimated by applying log-linear regression techniques via logarithmic transformation; and those coefficients will be the elasticities. Logarithmic transformations are a convenient means of transforming a highly skewed variable into one that is more approximately normal. (In fact, there is a distribution called the *log-normal* distribution defined as a distribution whose logarithm is normally distributed – but whose untransformed scale is skewed.). The reason for applying Log in the study is due to the different distribution of data used for the analysis. Some are thousand while some are in million. Therefore, taking their log to remove the skewness. Taking natural logs of both sides of the equation, we have:

$$\text{Log ROE}_t = \beta_0 + \beta_1 Log ATM_t + \beta_2 Log POS_t + \beta_3 Log MM_t + \beta_4 Log WP_t + \beta_5 Log IBT_t + u_t \text{ ----------(3)}$$

However If the variables under consideration are cointegrated, there will need to estimate an error-correction model. co-integration provides the theoretical underpinning for the error-correction model.

3.3. Expected Results

On apriori basis $\beta_0 > 0$

$$\beta_1 > 0, \beta_2 > 0, \beta_3 > 0, \beta_4 > 0 \text{ and } \beta_5 > 0$$

In other words it implies a significance relationship between the dependent variables ATM_t, POS_t, MM_t,WP_t, IBT_t and the independent variable ROE.

6.4. Data Presentation

Hypothesis One

H0: The use of ATM, POS, MM, WP and IBT in financial institutions has no significant impact on the ROE of commercial bank.

H1: The use of ATM, POS, MM, WP and IBT in financial institutions has significant impact on the ROE of commercial banks.

Hypothesis Two

H0: There is no long term equilibrium relationship between the ICT variables and Commercial banks performance in Nigeria.

H1: There is long term equilibrium relationship between the ICT variables and commercial bank performance in Nigeria.

Table-1. Descriptive Statistics

	ROE	ATM	POS	MM	WP	IBT
Mean	3430101.	34786452	299794.3	436133.3	346138.8	55111.58
Median	1098196.	20589334	245891.0	362059.5	342453.5	24916.00
Maximum	17522858	1.02E+08	1183394.	1311382.	723755.0	149945.0
Minimum	47198.40	1633957.	5138.000	10844.00	49219.00	13387.00
Std. Dev.	5341535.	37000918	261088.0	425993.4	202559.6	51426.08
Skewness	1.849943	0.809455	1.608112	0.724448	0.122442	0.983113
Kurtosis	4.996807	1.914819	6.006682	2.191520	2.207571	2.088722
Jarque-Bera	20.62245	4.431565	22.61494	3.211759	0.802563	5.479213
Probability	**0.000033**	**0.009068**	**0.000012**	**0.000713**	**0.009461**	**0.004596**
Sum	96042837	9.74E+08	8394239.	12211733	9691887.	1543124.
Sum Sq. Dev.	7.70E+14	3.70E+16	1.84E+12	4.90E+12	1.11E+12	7.14E+10
Observations	28	28	28	28	28	28

Source: Authors Computation, 2018 (Eview-8.0)

Table-2. Results of Johansen Multivariate Cointegration Test

Sample (adjusted): 2006Q3 2015Q4
Included observations: 26 after adjustments
Trend assumption: Linear deterministic trend
Series: ROE ATM POS MM WP IBT
Lags interval (in first differences): 1 to 1
Unrestricted Cointegration Rank Test (Trace)

Hypothesized		**Trace**	**0.05**	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.950652	183.0866	95.75366	0.0000
At most 1 *	0.887984	104.8564	69.81889	0.0000
At most 2 *	0.675722	47.93943	47.85613	0.0491
At most 3	0.322398	18.65942	29.79707	0.5176
At most 4	0.243068	8.540360	15.49471	0.4096
At most 5	0.048765	1.299835	3.841466	0.2542

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon *et al.* (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		**Max-Eigen**	**0.05**	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.950652	78.23023	40.07757	0.0000
At most 1 *	0.887984	56.91699	33.87687	0.0000
At most 2 *	0.675722	29.28001	27.58434	0.0300
At most 3	0.322398	10.11906	21.13162	0.7334
At most 4	0.243068	7.240525	14.26460	0.4611
At most 5	0.048765	1.299835	3.841466	0.2542

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon *et al.* (1999) p-values
Source: Authors Computation, 2018 (Eview-8.0)

Table-3. Parsimonious Error-Correction Model of ROE

Dependent Variable: Δ(ROE)
Method: Least Squares
Sample (adjusted): 2006Q2 2013Q4
Included observations: 27 after adjustments

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-2510728.	1240828.	-2.023430	0.0566
Δ(ATM)	-0.035721	0.058906	-0.606407	0.5511
Δ(POS)	3.381674	3.185298	2.061651	0.0010
Δ(MM)	-0.998417	1.479576	-0.674799	0.5075
Δ(WP)	-3.380950	3.882570	-2.870802	0.0642
Δ(IBT)	98.86152	35.34348	2.797164	0.0111
ECM(-1)	-0.797127	0.203382	3.919350	0.0008
R-squared	0.903172	Mean dependent var		3555394
Adjusted R-squared	0.874124	S.D. dependent var		5401196.
S.E. of regression	1916294.	Akaike info criterion		31.98810
Sum squared resid	7.34E+13	Schwarz criterion		32.32406
Log likelihood	-424.8393	Hannan-Quinn criter.		32.08800
F-statistic	31.09198	Durbin-Watson stat		2.052941
Prob(F-statistic)	0.000000			

Source: Authors Computation, 2018 (Eview-8.0)

4. PRE-ESTIMATION DIAGNOSTICS TESTS

4.1. Descriptive Statistics

The summary statistics for the variables: ROE, ATM, POS, MM, WP and IBT are as shown in Table 1. The means for ROE, ATM, POS, MM, WP and IBT are different. This indicates that the variables exhibit significant variations in terms of magnitude, suggesting that estimation in levels will not introduce some bias in the results.

The Jarque-Bera statistic for all the variables is significant; hence we reject the null hypothesis and conclude that the series is normally distributed (or have a normal distribution).

4.2. Co-Integration Test

The co-integration tests in Table 2 are undertaken based on the Johansen and Juselius (1990) maximum likelihood framework. The essence is to establish whether long-run relationships exist among the variables of interest. If two or more time series are not stationary, it is important to test whether there is a linear combination amongst them (Koutsoyiannis, 1977). Variables are co-integrated if they have a long term or equilibrium relationship between them. It is a pre-test to avoid spurious regression situations. The results show that the trace statistics test rejected the null hypothesis of no co-integration among the variables at the 5% level of significance. The trace statistics indicate 3 co-integrating equations at the 5% level of significance. The co-integration test results are therefore uninformative about the number of co-integrating relations among the variables. Max-eigen test indicates 3 co-integration equations at the 5 percept level co-integrating equation.

The co-integration result as captured in the analysis rejects the second null hypothesis ($H0_2$), and accepts the second alternative hypothesis ($H1_2$), which states that there is a long term equilibrium relationship between the ICT variables and commercial bank performance in Nigeria.

4.3. Model Estimation and Interpretation

After the iteration process was conducted, a preferred parsimonious regression model was obtained. The parsimonious error correction model result in table 3 indicates that the R^2 (R-squared) approximately 90.31percent, and this shows better goodness of fit, meaning that there is a strong relationship between the variables used. Thus, it shows that 90.31 percent (90.31%) changes or variation in ROE are explained by ATM, POS MM, WP and IBT, leaving 9.6 percent (9.6%) changes or variations in ROE to the (white noise) error term. The goodness of fit result thus shows that there is a strong positive impact of ICT on commercial bank performance. The researcher thus rejects the first null hypothesis ($H0_1$) and accept the first alternative hypothesis ($H1_1$). The Durbin-Watson (DW) statistics of 2.05 denotes the absence of serial correlation (autocorrelation) in the residuals.

The Error Correction Model parameter (ECM) is negative, less than unity as expected and significant. The ECM is an error correction term that guides the variables (ATM, POS, MM, WP and IBT) of the system to restore back equilibrium, and validates that there exist a long run equilibrium relationship among the variables (ATM, POS, MM, WP and IBT). Thus, the value of the ECM approximately gave 79.71%, meaning that the commercial bank's system corrects (or adjusts to) its previous dis-equilibrium period at speed of 79.71% quarterly, and thereby gives the validity that ATM, POS, MM, WP and IBT have long-run equilibrium relationship among them.

The F-statistics which measures the overall significance of the model shows that we cannot reject the alternative hypothesis. The F-statistics shows that the model is statistically significant, and as such, the researcher rejects the First null hypothesis ($H0_1$) and accept the First alternative ($H1_1$) which state that ICT has a significant impact on the commercial bank's performance in Nigeria

4.4. Discussion of Research Findings

The coefficient (-0.035721) for ATM's usability shows a negative influence on the ROE and is also not statistically significant. This could be attributed to the fact that ATM commission on every withdrawal made with it has been dropped by the CBN. This finding indicates that the use of ATM's does not influence commercial bank's performance in Nigeria.

The POS usage variable shows a positive and significant influence on ROE. The POS usage has greatly improved transaction activities, and has also greatly increased the commercial bank's returns. However, the mobile money usages (MM) had a negative influence on ROE and were found also to be statistically insignificant with

ROE. The reason could be deduced from the fact that most Nigerians do not use their telephone lines for transaction activities due to network out of order problems. This product has also experienced low patronage due to inadequate awareness and education of the customer on how to maximally use their phones to transact simple banking operations, and as a result has not contributed immensely to commercial banks performances.

The coefficient (-3.380950) related to various Web payment usages (WP) provided by commercial banks is negatively related to ROE and not statistically significant. The finding indicates that an increase in investments in those banking services does not significantly influence bank performance. Interbank transfer (IBT) usage variable was found to be positively related to ROE of commercial banks and was also found to be statistically significant. This is attributable to the fact that all the commercial banks in Nigeria had adopted the ICT usages in transactions, thus making the transfer of funds from one bank to another very easy and accessible.

5. CONCLUSION AND RECOMMENDATIONS

Technological development particularly in the area of information and communication technology is transforming the way commercial banks operate and do business in Nigeria. This has resulted in changes in the volume of trade, the interconnection between firms and increased business transactions from the national to international market places and this has also set in motion a revolution in the banking sector. Commercial banks are now required to invest in ICT for the provision of a transaction and payment system that is compatible with the demands of the electronically interconnected global market place. The adoption of various forms of ICT has greatly influenced the content and quality of banking operations and performance. The findings reveal that ICT (technology innovation) has influenced Nigerian banking industry performance. ICT has specifically increased banks Return on Equity. The research has shown that there has been a remarkable relationship between the increased volume of interbank transfers, use of POS on the one hand and ROE on the other hand. This means that the Nigerian banking sector made more profit from interbank transfers and the use of POS than any other form of ICT enabled services such as ATM, WP and MM respectively.

In addition, this research has shown that through information and communication technology payment for goods and services and every other kind of transactions has been made easy via self-service facilities (automated customer service machines) from where prospective bank customers can complete their account opening documents directly online. It has assisted customers to validate their account numbers and receive instruction on when and how to receive their cheque books, credit and debit cards and POS services. The study recommends that investment in ICT should form an important component in the overall strategy of banking operation. It is imperative for bank management to intensify investment in ICT products to facilitate speed, convenience, and accurate services. These will make Nigerian banks to be efficient, profitable, and competitive and to cope with the changes and challenges that are the outcome of the ICT controlled the globalised economy.

5.1. Policy Recommendations

On the basis of the finding of this study, the following recommendations were made:

- Investment in ICT has been proven to enhance the performance of Nigerian commercial banks. The banks should therefore give emphasis to efficient utilization of the ICT enabled services such as credit and electronic cards to pay at retail outlets, points of sales (POS), phone banking, electronic payment debit, Automated Teller Machines (ATM), home banking, internet banking, mobile banking, personal digital assistant banking.
- The study recommends that every bank in Nigeria should not only invest heavily on ICT especially the POS, but should distribute same to business outlets where business owners and customers will have access to smooth and hassle free transactions. It is therefore necessary for the government to emphasize the need

for more policies that will boost the efficiency in utilization of ICT equipment by reducing the cost of acquiring them so as to reduce cost and boost the growth of the economy.

- The banks should embark on aggressive campaign and re-orientation of clients to create awareness for the customers to patronize the facilities especially in the area of use of POS, mobile banking and so on. Acceptance of these facilities will consolidate the gains from investing in them. In achieving this, every bank should partner with the government to make internet connectivity cheap and accessible, especially in the rural areas.
- The government should emphasize the need for more policies that will boost the use of ATM, POS, MM, WP and IBT hence long run equilibrium relationship with commercial banks performance.
- Government and Banks should encourage consistent use of ATM, POS, MM, WP and IBT. These will sustain the ROE of commercial banks in the long run

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APPENDIX

Scatter Diagram