



The Impact of Information Management Systems on the Performance of Commercial Banks in Nigeria

Chukwuedozie N. Ezema^{1*}, Ernest O. Nonum², Chukwuebuka N. Umezinwa³ and Uche Anakwenze⁴

¹*Department of Electronic and Computer Engineering, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.*

²*Novena University, Ogume, Delta State, Nigeria.*

³*Department of Electronic and Computer Engineering, Imo State Polytechnic Umuagwo, Imo State, Nigeria.*

⁴*Electronic Development Institute (ELDI), Awka, Nigeria.*

Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/ACRI/2018/25120

Editor(s):

(1) Yanpeng Li, Mayo Clinic, USA.

Reviewers:

(1) Kexin Zhao, University of Florida, USA.

(2) R. Praveen Sam, Jawaharlal Nehru Technological University, India.

Complete Peer review History: <http://www.sciencedomain.org/review-history/25971>

Original Research Article

Received 19th February 2016

Accepted 30th June 2016

Published 23rd August 2018

ABSTRACT

This study assessed the impact of Information and Communication Technology (ICT) on the performance of commercial banks in Nigeria for the period 1991 to 2012 using data sourced from 11 sampled commercial banks in Onitsha, Anambra State. This study applied Ordinary Least Square approach econometric techniques, Fixed and Random Effects Models in its analysis to ascertain the relationship between Banks Performance and the Application of ICT. The results indicate that Random Effects Model was appropriate. Also the findings reveal that the use of ICT in Nigerian banking industry increased return on equity. The regression and factor analysis showed that an insignificant size of profit exist without the introduction of ICT implying that ICT has a positive effect on profitability. Furthermore, the findings indicate strong relationship between sustained investment in ICT and efficiency. The study recommends among other things the enforcement of more policies that will boost proficient/appropriate utilization of ICT equipment rather than additional investments.

*Corresponding author: Email: ecnaxel@gmail.com;

Keywords: Information management systems; Automatic Teller Machine (ATM); automated cheque sorter; electronic fund transfer; electronic data interchange; local area network; wide area network; point of sales system.

1. INTRODUCTION

Information is very vital for the actualization of various organizational objectives especially in the contemporary business milieu that is very dynamic due to creativity, innovation, hi-tech changes, increased perception and demands from clienteles. The banking industry operate in a complex and competitive environment distinguished by changing conditions and highly unpredictable economic climate with Information and Communication Technology (ICT) at the core of the change curve.

The rise in demand for information and communication technology (ICT) in Nigerian banking sector and the world at large has become imminent and unavoidable [1]. Invariably, the future lies in the ICT driven banking systems and services. Banks have embarked on deployment of ICT based banking products and services such as automated teller machine (ATM), internet banking, mobile banking solutions, point of sale terminals, computerized financial accounting and reporting, human resources solution among others [2].

Linked to this, was the banking license liberalization of the early 1990s in Nigeria. The landmark period witnessed the birth of the new generation banks (i.e. GT Bank, Zenith Bank, etc.) that commenced operations with the state-of-the-art technology, which exposed the sluggishness and inefficiency of the older banks (i.e. the three Giants; First Bank, UBA and Union Bank). Some researchers had shown that the then re-engineering fever, compelled the old generation banks to change. It was further stated that the trend actually took selected commercial banks some time to follow suit because the issues were much more than designing algorithms and chewing seminal computing papers from first class journals.

Today's business environment is extremely dynamic and experience rapid changes as a result of Technological improvement, increased awareness, and more efficient and diversified services. Banks have traditionally been in the forefront of harnessing technology to improve their products and services.

Banking operation in the 21st century is characterized by complex and competitive

environment, changing conditions and highly unpredictable economic climate. [3] asserts that they have over the time been using electronic and telecommunication networks for delivering a wide range of value added products and services. Managers in Banking Industry in Nigeria cannot ignore Information technology because of its critical role in modern Banking operations. It is evident that the entire cash flow of most fortune Banks are connected to Information system.

A Bank's success depends on how well it is able to manage the customers through the provision of efficient service delivery, product innovation, security of customers' investments and the speed with which all these services are provided. A sure way of improving the services is through the application of Technology [4]. Thus the application of ICT concepts and techniques in banking operations has been a subject of primary significance and concern to all banks and indeed a precondition for local and global competitiveness in banking. The emergence of rapid expansion of technology has brought information to the door step of people all over the world. Individual and organization no longer need to be physically present in any particular location in order to transact business. As progress in it further reduces the cost of communication and improves access to efficient producer services, it has become an increasingly important determinant of economic productivity and competitiveness.

Technological advancement has played an important role in improving service delivery standards in Banking Industry. Customers' views about what is convenient are changing rapidly as a result of technological innovation, which act as a delivery channels in today Banking in Nigeria. These technological innovations are: Automatic Teller Machine (ATM), Automated Cheque sorter, Electronic Fund Transfer, Electronic Data Interchange, Electronic Home and office banking, Home and office computers, Cell phone, Automated Teller dispensing cash and accepting deposits, Point of sale terminals in retail stores, and Credit Cards that grant access to an instant loan any time and any place [5].

From banks perspective, technology is very important in the following areas: expanding profit

pool, operational efficiency, customer care, distribution and reach, product innovation and efficient payment and settlement [6]. Therefore, it is obligatory for banks to adopt best and conventional technology for the achievement of corporate goals.

[7] observed that since 1980s, the Nigerian banking sector in contrast with the other industrial sectors of the economy have fared better in their investment profile and use of ICT systems. The study carried out by African Development Consulting Group Ltd. (ADCG) on IT diffusion in Nigeria shows that banks have invested more on IT, IT personnel, PCs, LANs, WANs and Internet linkage than other sectors of the Nigerian economy. Findings from the study reveal that whilst most of the banks in the west and other parts of the world have at least one PC per staff, Nigerian banks are lagging seriously behind, with only a PC per capital ratio of 0.18. [2] asserts that the innovations in ICT have made the banking sector move from the traditional mode of operations to presumably better ways with technological innovation that improves efficiency. The use of ICT enhances efficiency and especially in recent times that there is rapid decline in the price of ICT gadgets. This has increased the level of ICT usage in bank [8]. The increased might have also been attributed to the business environment that became relatively flexible to accommodate new forms of technological innovation as a result of reforms in the country.

2. METHODOLOGY

2.1 Research Design

The design of the study was survey. In this study, secondary data in the form of panels have been

2.3.1 Mathematical specification of the model used to examine the impact of ICT on profitability of bank

$$ICT = f(ROA, ROE, DIV, PAT) \tag{1}$$

$$ICT = a_0 + a_1ROA + a_2ROE + a_3DIV + a_4PAT + \dots + et \tag{2}$$

Where

ICT	-	-	-	Amount spent on Information communication Technology
L	-	-	-	Log
$a_0 - a_6$	-	-	-	Parameter structure
et	-	-	-	error term
X_1	-	-	-	return on assets
X_2	-	-	-	equity
X_3	-	-	-	dividend
X_4	-	-	-	Profit after tax

used. The data have been collected from the banks' annual financial reports, statistical bulletins and Fact books. The data comprises of net profits, total assets, total equity, ATM machines and e-banking services of the selected commercial banks. The period that will be covered in this work is from 1991-2012.

2.2 Method of Data Analyses

The data collected were analyzed using descriptive statistics such as tables, percentages, mean. The test of Hypotheses is achieved using both primary and secondary data. Independent samples T-test is conducted for each hypothesis at the appropriate level of confidence (0.05).

The ordinary least Square Technique (OLS) is applied to determine the equation. OLS is applied in order to avoid bias as well as obtain the appropriate association of values measured. The equation is logged because the log linear form allows a direct estimation and interpretation of the coefficient of the model. Also simple and multiple regression technique which is based on more than two variables will be applied in this study. The software used for analysis include E-view 7 version, STATA econometric package version 11 and SPSS 16 package, 2007 version.

2.3 Model Specification

The empirical models are specified as follows:

Model specification is based on theoretical foundation [9]. It involves expressing the models in the mathematical and econometric form, which will be expressed theoretically. The models are specified in the following ways:

2.3.2 Mathematical specification of the model used to determine if the use of ICT in Nigerian banking industry increase return on equity

In trying to determine if the use of ICT in Nigerian banking industry increase return on equity, the following model has been used:

$$BP = \beta_0 + \beta_1 \text{Profit} + \beta_2 \text{ATM} + \beta_3 \text{ebserv} + \mu \quad (3)$$

Where

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

2.3.3 Hausman specification test for best model selection

In a bid to select the use of the best model for the regression analysis series of tests were carried out. According to [10] either of the fixed-effects or random-effects estimators would be the best linear unbiased estimator (BLUE). To achieve this, the Hausman specification test was used. At the end of the test the random effects estimator was selected as the most appropriate of the two.

2.4 Variables and Measurements

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

2.4.1 Dependent variable

Bank Performance – 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 bank's 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 ([11]; [12]; and [13]). But in this study we have used return on equity as a proxy on bank performance.

2.4.2 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 [11,12] and [13].

- ii. ATM's this variable was measured by the number of ATM used by each bank [14]. Other control variable is:
- iii. E-banking services in order to show the level of e-banking application by each bank of the selected banks.

2.5 Underlying Assumption

- i. Random variable error with a mean of zero conditional on the explanatory variables.
- ii. Representative sample of the population for the inference prediction.
- iii. Error free variables.
- iv. The predictors are linearly independent.
- v. The errors are uncorrected, that is, the variance-covariance matrix of the error is diagonal and non-zero element is the variable of the other.
- vi. The variance of the error is constant across observation (homoscedesticity).
- vii. The parameter estimates will be unbiased.

3. RESULTS AND DISCUSSION

3.1 Presentation of Data

Data for this analysis is mainly from secondary sources. These include the Central Bank of Nigeria Statistical Bulletin, Nigerian Deposit Insurance Corporation (NDIC) and the financial Statement of the selected banks. The variables are presented in Table 1.

Table 1 shows the extent of application of ICT products in the surveyed banks. It is evident from the table that the most widely applied technology is the Local Area Network (LAN). Most of the banks that have fully networked their systems within the bank found communication of account information easy. MICR cheques were also highly utilized by the banks as thirty four banks had fully applied its use while the remaining two banks had partly applied it. Findings show that the need to overcome the problem of handling growing volumes of cheques gave rise to the earliest developments in the use of computers in banks.

Electronic Funds Transfer (EFT), Wide Area Network (WAN) and Program for Daily Calculation of Accounts witnessed high level of application among the studied banks. Smart Cards, Point of Sales System (POS) and Computerized Credit Rating were not very

Table 1. Scope of application of ICT products

ICT products	x	f	fx	\bar{X}
Automated teller machine				1.69
Fully Applied	3	4	12	
Partly Applied	2	8	16	
Not Applied	1	12	12	
Electronic funds transfer				2.58
Fully Applied	3	-	48	
Partly Applied	2	16	10	
Not Applied	1	5	3	
Electronic data interchange				1.83
Fully Applied	3	3	18	
Partly Applied	2	6	14	
Not Applied	1	7	11	
Smart cards				
Fully Applied	3	11	33	2.14
Partly Applied	2	11	8	
Not Applied	1	4	9	
MICR cheques				3
Fully Applied	3	9	72	
Partly Applied	2	24	72	
Not Applied	1	-	66	
Local area network				3
Fully Applied	3	-	4	
Partly Applied	2	24	-	
Not Applied	1	-	30	
Wide area network				2.92
Fully Applied	3	-	12	
Partly Applied	2	22	8	
Not Applied	1	2	12	
Point of sales system				2.11
Fully Applied	3	-	16	
Partly Applied	2	10	12	
Not Applied	1	6	15	
Electronic home and office banking				1.93
Fully Applied				
Partly Applied	3	8	16	
Not Applied	2	4	12	
Telephone banking	1	8	21	
Fully Applied				2.07
Partly Applied	3	12	14	
Not Applied	2	5	10	
Make cheque available program	1	8		
Fully Applied	3	12		1.92
Partly Applied	2	7		
Not Applied	1	10		
Computerized credit rating				2.11
Fully Applied	3	10	30	
Partly Applied	2	6	12	
Not Applied	1	8	8	
Daily calculation of accounts program				2.92
Fully Applied	3	22	66	
Partly Applied	2	2	4	
Not Applied	1	-	-	

X = response, f = frequency, \bar{X} = mean

Source: Research Survey, 2016

common as less than half of the studied banks had fully applied them. Other ICT products such as ATM, Electronic Data Interchange, Electronic Home and Office Banking, Telephone Banking and Make Cheque Available Programs were yet to be applied by most of the studied banks. The least fully applied technologies were ATM with only 4 (16.7%), Electronic Home and Office Banking with 4 (16.7%) and Telephone Banking with 5 (20.8%). Cost, fear of fraudulent practices and lack of facilities essential for their operation could be attributed to the low rate of application of these technologies in the surveyed banks.

Electronic data processing technique has made manual calculation of bank statement, balances and interests obsolete. Manual typists were replaced by computer operators just as messengers were no longer required to sort files manually anymore. Access to records in Banks is now made easier through electronic filing system by a click of cursor. Electronic scanning has interfaced manual verifications of signature and pictures. Fund transfer has become easier by modern technologies such as SWIFT.

Customers' transactions were monitored in each of the studied banks. The transactions were put into six groups represented as T1, T2, T3, T4, T5, and T6. T1 stood for deposit; T2 for withdrawal, T3 for enquiries, reference letters, opening and closing of accounts; T4 stood for funds transfer, T5 for special bills while T6 stood for loans and overdraft.

From Table 2, customers on the average spend 21.58 minutes for loans and drafts as most activities in these areas still relied on manual responses. Customer account

details and status of credit worthiness relied on manual processes. Funds transfer relied on Wide Area Network but in most cases there were low responses or complete absence of signal from where the funds originate. To minimize anticipated challenges, ICT design that will reduce manual processes and enhance transmission of electronic signals should be integrated into funds transfer operations.

From Table 3 and the Fig. 1, it can be seen that the level of technology advancement in the firm remain approximately constant for a very long period of time from 1991 to 2003. There exists improvement from 2004 to 2010 as shown above, although, there was slight downward trend from 2011.

Interpretation: Correlation is said to be strong if the value is more than 0.5 and weak if it is less than 0.5. The negative sign implies inverse proportion and positive sign implies direct proportional relationship. From Table 4, the correlation between technology and Return on Assets is 0.93 which implies strong positive relationship and this can be interpreted in a layman's language as return on assets increases as involvement of technology increases. Also, there exists strong positive relationship between equity and technology, dividend and technology, as well as, profit after tax and technology. There exist weak relationship between interest rate and technology and exchange rate and technology which implies these factors do not contribute significantly in the involvement of technology in the operation.

For easy comprehension, bar chart (Fig. 2) depicts the data shown in Table 5.

Table 2. Types of transaction and time spent by customers on each transaction

Activities	No. of customers	Total time system	Mean
deposit	417	2238	5.36
withdrawal	577	2999	5.20
enquiries, reference letters, opening and closing of accounts	92	684	7.43
funds transfer	56	648	11.57
special bills	23	70	3.04
loans and overdraft	33	712	21.58

Source: Research Survey, 2016.

Table 3. Measures of technological advancement in one of the selected banks (Union Bank of Nig. Plc)

Years	ROA N'm	ICT N'm	ROE N'm	DIV %	PAT N'm
1991	507804	21557	77460	0.96	5191
1992	507733	21562	77491	0.96	5192
1993	507642	21557	77450	0.95	5185
1994	508039	21554	77440	0.96	5198
1995	507518	21575	77583	0.96	5195
1996	507371	21544	77329	0.96	5164
1997	509229	21543	77408	0.97	5236
1998	505956	21639	78012	0.94	5186
1999	506929	21450	76569	0.98	5071
2000	514804	21514	77644	1	5453
2001	496136	21954	79825	0.83	5035
2002	509848	20883	72238	1.13	4726
2003	549230	21706	80871	1.4	6600
2004	429332	23273	86366	1.6	7750
2005	550983	17672	49479	1.3	10039
2006	667766	24175	106770	1.38	10802
2007	69247	27973	102851	1.1	13223
2008	923593	63804	115806	1.61	18602
2009	1166866	113206	132613	2.25	26107
2010	1417567	178351	153258	1.45	33699
*2011	1292217	145779	142946	1.85	29936
*2012	1292216.7	145778.7	142939	1.85	29914

Source: Central Bank of Nigeria (CBN) statistical Bulletin (various editions) - Union Bank of Nigeria plc, annual report and financial statement (various editions)

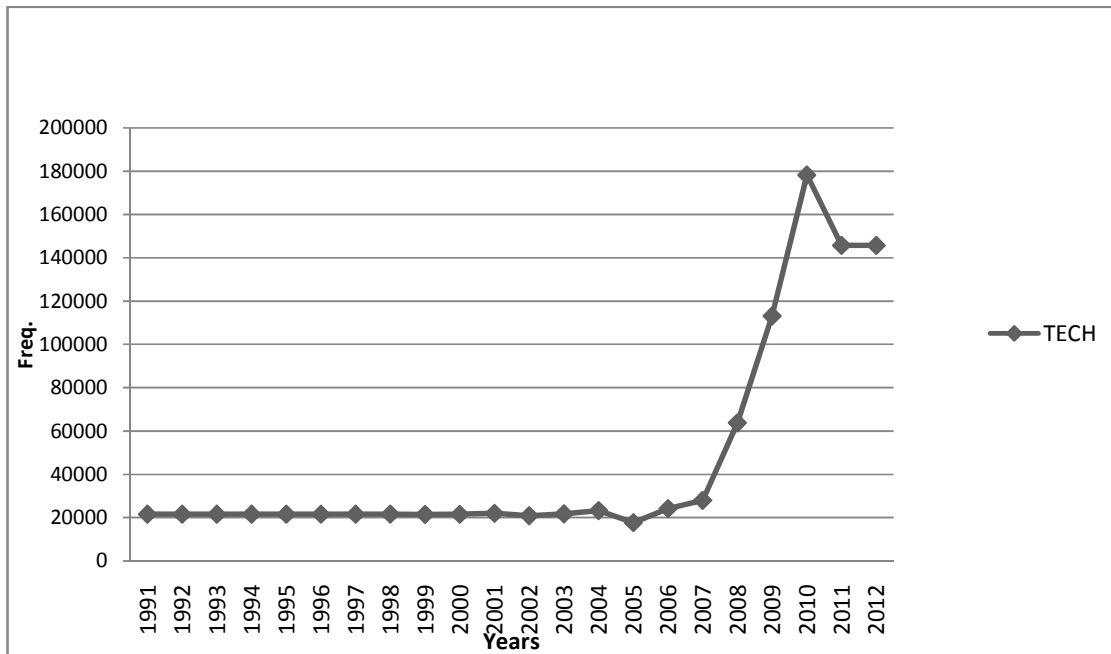


Fig. 1. Line chart of technology involvement of union bank from 1991 to 2012

Table 4. Correlation Matrix/analysis for financial indicators

	ROA	ICT	ROE	DIV	PAT
IR	-0.395735	-0.431896	-0.456700	-0.476938	-0.513938
ER	0.354872	0.397710	0.443554	0.647889	0.511703
ROA	1.000000	*0.935946	0.841620	0.741042	0.895838
ICT	0.935946	*1.000000	0.926559	0.722082	0.970604
ROE	0.841620	*0.926559	1.000000	0.745701	0.938875
DIV	0.741042	*0.722082	0.745701	1.000000	0.806330
PAT	0.895838	*0.970604	0.938875	0.806330	1.000000

Source: Research Survey, 2016.

Table 5. Amount lost to ICT fraud and other category of fraud

Years	Total Loss (N'm)	Amount Lost to ICT Fraud (N'm)	Amount Lost to other Category (N'm)
1991	14161	8503	5658
1992	14166	9158	5008
1993	14156	8435	5721
1994	14176	9175	5001
1995	14138	7588	6550
1996	14210	9229	4988
1997	14065	7032	7031
1998	14365	7111	7254
1999	13760	4289	9471
2000	14969	5104	9865
2001	12551	3983	8568
2002	17386	6925	10461
2003	13948	8754	5194
2004	12835	5706	7129
2005	6525	3251	3274
2006	9680	2814	6866
2007	11026	5201	5825
2008	8892	4210	4682
2009	14682	10902	3780
2010	8750	2509	6241
*2011	10233	4837	5406
*2012	11221.67	6082.67	5142.33

Source: Central Bank of Nigeria (CBN) statistical Bulletin (various editions) -Union Bank of Nigeria plc, annual report and financial statement (various editions)

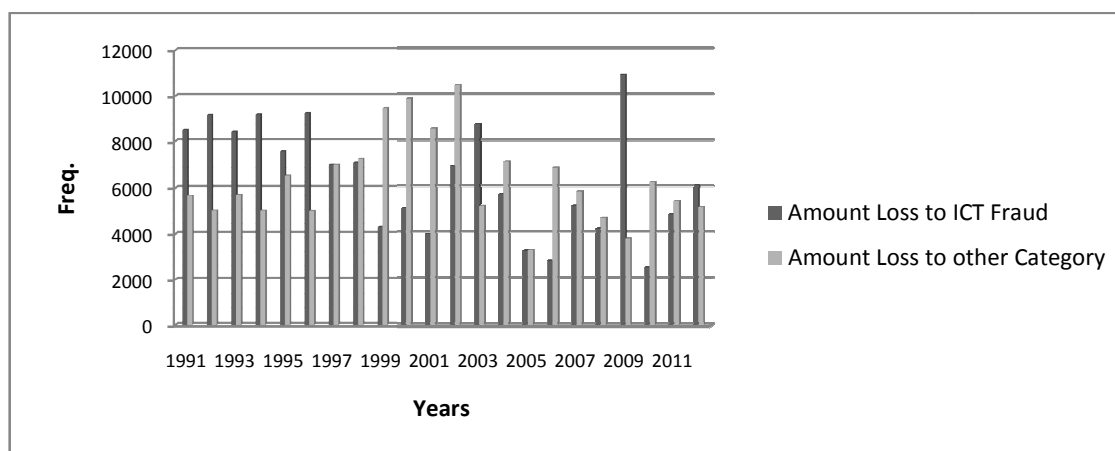


Fig. 2. Bar chart of amount lost to fraudulent act in the bank

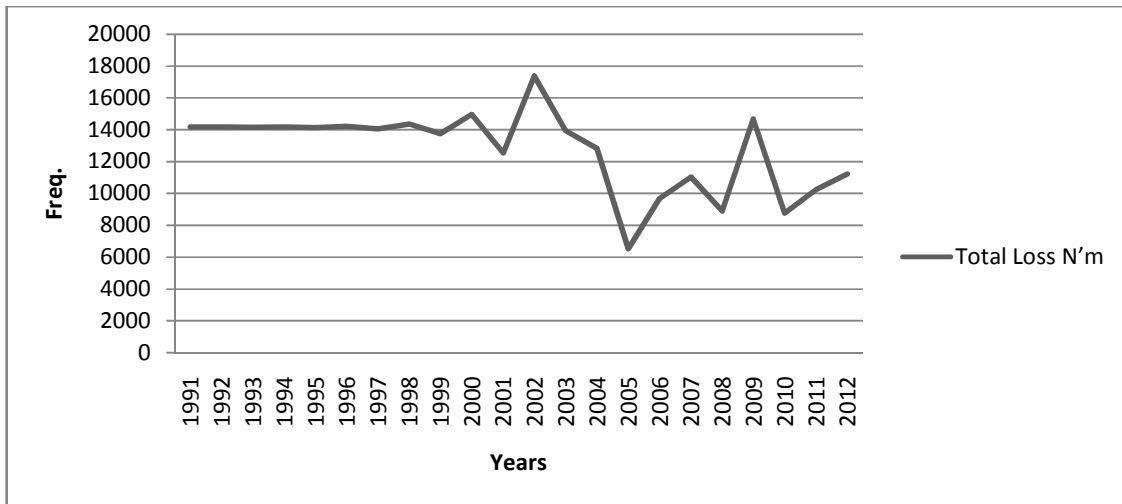


Fig. 3. Line chart of fraudulent act in the bank

Fig. 3 shows the amount lost to fraudulent acts in Union Bank at every interval. 2002 followed by 2009, there was high increase in amount of loss for fraudulent act, 2010-2012 shows slight increase in amount of loss for fraudulent act, which is a corrective signal.

in 2007-2009. When it gets to 2011, they are at the same level. Although in 2012 there was a slight increase in amount lost to ICT fraud. This shows that the occurrence of ICT fraud in Nigerian banks is not high, because it is not significantly different from non ICT fraud. Thus the rate of ICT fraud is not high beyond normal. T- test was conducted to check the level of significance, which is shown in Tables 7 –11.

From Fig. 4, between 1991-1996, amount lost to ICT Fraud was above other category of fraud, from 1999-2001 Amount lost to other category of fraud was above ICT fraud, from 2001-2003 ICT fraud was above other category of fraud and also

Table 6 shows the descriptive statistics used in the study.

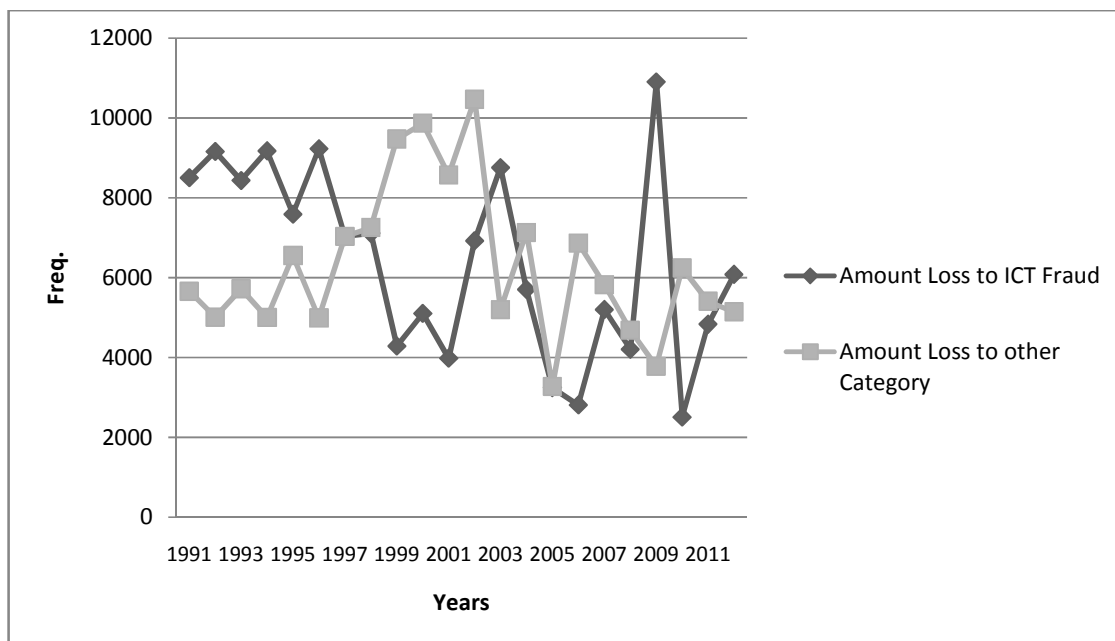


Fig. 4. Line chart of fraudulent act in the bank

Table 6. 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

3.2 ICT Impact on the Profitability of Commercial Banks in Nigeria

$$ICT = a_0 + a_1ROA + a_2ROE + a_3 DIV + a_4 PAT + e_t \quad (5)$$

Mathematically, the econometric model is expressed as;

Where e_t is the error term associated with the model or unexplained variables.

$$ICT = f(ROA, ROE, DIV, PAT) \quad (4)$$

Where ICT is Amount spent on technology, ROA is return on asset, ROE is equity, DIV is Dividend, and PAT is Profit after tax.

The regression equation can be expressed as;

4.3 Sustained loss through Information and Communication Technology (ICT) based Fraud

Estimations on the Sustained loss through Information and Communication Technology (ICT) related fraud is shown in Table 9.

Table 7. ICT impact on the profitability of commercial banks in Nigeria

Dependent Variable: F(x)

Method: Least Squares

Date: 07-01-13 Time: 05:26

Sample: 1991 2012

Included observations: 21

$$X = C(1)+C(2)*ROA+C(3)*ROE+C(4)*DIV+C(5)*PAT+.....$$

	Coefficient	Std. error	t-statistic	Prob.
C(1)	-25203.48	23051.83	-1.093340	0.2915
C(2)	423.0840	645.4056	0.655532	0.5221
C(3)	-14.66842	71.31013	-0.205699	0.8398
C(4)	0.051944	0.018248	2.846607	0.0123
C(5)	0.174860	0.271733	0.643501	0.5296
C(6)	-21823.27	13180.44	-1.655731	0.1185
C(7)	4.071921	1.056281	3.854960	0.0016
R-squared	0.965193	Mean dependent var		47846.45
Adjusted R-squared	0.951270	S.D. dependent var		53294.29
S.E. of regression	11764.63	Akaike info criterion		21.83695
Sum squared resid	2.08E+09	Schwarz criterion		22.18410
Log likelihood	-233.2065	Hannan-Quinn criter.		21.91873
F-statistic	69.32449	Durbin-Watson stat		1.835627
Prob(F-statistic)	0.000000			

Source: Research Survey, 2016.

Table 8. Regression results dependent variable: Return on equity

Independent variables	Fixed effects	Random effects
Net profit	2.17 (0.000)	2.19 (0.000)
ATM	0.017 (0.731)	-0.025 (0.485)
E-banking services	-4.648 (0.227)	0.631 (0748)
R ²	0.51	0.50
F	0.000	0.000
Std Error	24.29	16.24

Note: Figures in parentheses are t-values
Source: Research Survey, 2016.

Table 9. Two-sample T for amount lost to ICT fraud vs amount lost to other category

N	Mean	StDev	SE	Mean
Amount Lost to ICT	22	6414	2443	533
Amount Lost to OFR	22	6380	1921	419

Source: Research Survey, 2016.
Difference = μ (Amount Lost to ICT Fraud) - μ (Amount Lost to other Category)
Estimate for difference: 34.7619
95% CI for difference: (-1339.2646, 1408.7884)
T-Test of difference = 0 (vs not =): T-Value = 0.05 P-Value = 0.959 DF = 37

Table 10. Correlation analysis

	SL	ICTF	O FR
SL	1.000000	0.711586	0.465999
ICTF	*0.711586	1.000000	-0.290051
O FR	0.465999	-0.290051	1.000000

Source: Research Survey, 2016.

Table 11. Sustained loss through ICT based fraud

Dependent Variable: SL
Method: Least Squares
Sample: 1991 2012
Included observations: 21
SL = C(1) +C(2)*ICTF +C(3)*O FR

	Coefficient	Std. error	t-statistic	Prob.
C(1)	-3.385530	3.068361	-1.103368	0.2836
C(2)	1.000063	0.000260	3841.928	0.0000
C(3)	1.000340	0.000328	3050.837	0.0000
R-squared	0.999999	Mean dependent var		12722.53
Adjusted R-squared	0.999999	S.D. dependent var		2579.585
S.E. of regression	2.722374	Akaike info criterion		4.967010
Sum squared resid	140.8151	Schwarz criterion		5.115788
Log likelihood	-51.63711	Hannan-Quinn criter.		5.002057
F-statistic	9427422.	Durbin-Watson stat		1.912246
Prob(F-statistic)	0.000000			

The model is stated thus;
SL = -3.3855 + 1(ICTF) + 1(O FR)
Source: Research Survey, 2016.

4. CONCLUSION

The objective of this study is to identify whether information and communication technology (ICT) improves performance of commercial banks in Nigeria. Previous findings indicate that the use of ICT improves bank's performance, but does not specify the actual performance measure, i.e. return on assets or return on equity that the best measure efficiency of the bank's with the application of ICT. In order to contribute to this debate this study uses both fixed effects (FE) and random effects (RE) Models.

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

Checking the impact of ICT on profitability of banks in Nigeria, the analysis shows that ICT has positive impact on profitability of banks. Looking at the variables used, thus were dividend recorded over the years, profit after tax as declared by the bank, interest rate, exchange rate, return on assets and equity. The correlation analysis shows that there exist strong relationship between ICT and return on asset, ICT and equity, ICT and dividend, and profit after tax and ICT, the relationship is direct proportion in nature which implies the variables increase in the same manner. This implies for meaningful profit in the sector, these variables are to be considered with utmost attention. In the same manner, regression analysis was used to determine the mathematical relationship among the variables. The strength of the model is determined from the value of R-square. The R-square of the model is 0.965 which implies the independent variables can explain up to 96.5 percent of variability in the dependent variable. Since the percentage the independent variable can explain it large enough, this means the variables are adequate for proper modeling of impact of ICT on profitability of banks. Thus this findings show that ICT has a positive impact on the profitability of banks. Also, both ICT and Non ICT fraud contribute to loss in the bank. An increase in bank's profitability enhances commercial bank's performance in Nigeria. The coefficient related to e-banking

services (0.631) shows a positive influence on bank performance but it is not statistically significant.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Afolabi JA, Osita R. A non-structural test of competition in Nigerian banking industry. *NDIC Quarterly*. 2007;7(1).
2. Ovia J. Impact of website usability on performance: A heuristic evaluation of community bank homepage implementation. *Journal of Business & Economics Research*. 2005;9(7).
3. Steven HA. Impact of information technology on corporate performance: A study of selected banks in Nigeria. A Ph.D. Thesis submitted to the Postgraduate School, Usmanu Danfodiyo University, Sokoto; 2012.
4. Available:<http://www.ajbmr.com/articlepdf/ajbmr01n0411.pdf>
5. Ahmad H, Khababa JG. Competition and bank performance in Nigeria: An empirical analysis of the effect of competition on banks' profitability (1999 – 2004). *Readings in Management Studies*. Faculty of Management Sciences, Usmanu Danfodiyo University, Sokoto. 2009;1(240–258).
6. Available:<http://www.icommercecentral.com/open-access/optimizing-the-use-of-information-and-communication-tech...>
7. Woherem MC. The adoption of internet banking in Nigeria: An empirical investigation. *Journal of Internet Banking and Commerce*. 2010;12(4).
8. Available:<http://unpan1.un.org/intradoc/groups/public/documents/AAPAM/UNPAN026533.pdf>
9. Asogwa FO, et al. Inform technology, bank automation, and attitude of workers in Nigerian Banks. *Journal of Social Sciences*, Kamla-Raj Enterprises, Gali Bari Paharwali, India; 2013.
10. Yaffee D. Impact of electronic banking on customer services in Lagos, Nigeria, *Ife Journal of Economics and Finance*. 2005;5(1-2).

11. Adegbaju AA, Olokoyo FO. Recapitalisation and banks' performance: A case study of Nigerian banks. *African Economic and Business Review*. 2012;6(1).
12. Ahmad AT, Khababa R. A critical review of the impact of ATMs in Malaysia. *Banker's Journal Malaysia*. 2009;22(3–11).
13. Kim B, Kim NC. Information contagion and bank herding. *Journal of Money, Credit and Banking*. 2007;30(2).
14. Agbada AO. Electronic banking in Nigeria, problems and prospects from the consumer's perspective. *Central Bank of Nigeria Bullion*. 2014;32(4).

© 2018 Ezema et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<http://www.sciencedomain.org/review-history/25971>