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EFFECT OF INFORMATION AND COMMUNICATION TECHNOLOGY ON OPERATIONAL EFFICIENCY OF NIGERIA'S BANKING SECTOR

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Abstract: Innovations in information and communication technology (ICT) have brought rapid changes in modern banking operations. The banking environment occasioned by these innovations is also changing the perception of bank customers towards operational efficiency and customer satisfaction. This study was conducted to examine the effect of ICT adoption on the operational efficiency of Deposit Money Banks in Nigeria. The study was anchored on the technology acceptance theory and adopted the ex post facto research design. The population of the study consists of all listed DMBs in Nigeria. Time series data extracted from CBN Statistical bulletin and annual reports of DMBs for the period of 2012 – 2021 were used for the study. Findings of the study show that ICT adoption in form of web payment, value of ATM and POS transactions have a positive but non-significant effect on operational efficiency of the sampled DMBs. The study concludes that adoption of ICT positively influences the operational efficiency of listed DMBs in Nigeria and recommends amongst others the need for DMBs to improve on their online payment systems so as to facilitate ease of payment among bank customers.

Keywords: Information Communication Technology, Electronic Banking, Operational Efficiency, Deposit Money Banks.

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1. Introduction

The banking sector in the 21st century operates in a dynamic, complex and competitive environment and thus continues to undergo rapid changes due to revolutions in Information and Communication Technology (ICT). The banking industry in Nigeria is not an exception as the sector has also experienced the dynamic changes brough about by the emergence and adoption of electronic banking. Nwakoby, Sidi, and Ofobruku (2019) opine that the adoption of ICT has promoted the use of automated teller machines (ATM), Point of Sale (PoS) terminals and Internet based banking services which serve as main tools deployed by DMBs in Nigeria to provide banking services to customers. Nwaezeaku (2020) contend that the increased acceptance and dispersion of ICT enabled electronic and mobile banking instruments has provided a further distribution channel to retail banking in the Nigerian banking sector. In view of this, banks now seek to exploit the inherent benefits in implementation of ICT in their quest for a more efficient customer service delivery and maintain global relevance in the banking system.

However, DMBs in Nigeria still face challenges of continually adapting and modernizing their operations in a bid to improve quality of service, satisfy customers; and also reduce operating cost. But how effective has the adoption of electronic banking been in the Nigerian setting is still not clear in the literature. Results from prior studies are also conflicting as there appears to be no unanimous outcome on how the implementation of ICT has enhanced performance of DMBs. It is also seen from review of previous literature that most studies focus on profitability as measure of performance. This study makes a strong departure from previous researches by adopting a distinct measure of performance through the use of operational efficiency. 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 operational efficiency of DMBs in Nigeria.

Objectives of the Study

The general objective of the study is to investigate the effect of ICT on operational efficiency of Deposit Money Banks in Nigeria. However, the following are the specific objective of the study;

i. to examine the influence of web payment transactions on operational efficiency of DMBs in Nigeria;
ii. to evaluate the effect of ATM transactions on on operational efficiency of DMBs in Nigeria.
iii. to ascertain the impact of POS transactions on performance of DMBs in Nigeria.

2. Literature Review

Operational Efficiency

Operational efficiency is a performance measure that indicates the ratio of input to output. It is measurement technique which indicates the extent to which a firm is able to cover operational expenses using income generated during a given period of time (Schafer & Fukasawa, 2011). It is useful in appraising the performance of a business concern. Banu (2019) views operational efficiency as the technique of making the most out of the available resources. The effective use of men, material, machine and money employed to produce the highest output is also used to describe operational efficiency of a business concern.

Alemayehu and Belete (2019) posit that banks' operational efficiency plays a key role in the productivity of the economy. Aveh, Krah, and Dadzie (2013) state that a higher operation efficiency ratio, gives an indication of a better use of limited resources and the ability of a firm to be financially sustainable. There are a number of variables that have been used to measure firm operational efficiency. These ratios measure overall effectiveness of the firm in utilizing its assets to generate sales, quality of

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receivables and success in collection, effectiveness of inventory management practices and efficiency of the firm in controlling its expenses. A key gauge of management effectiveness is in the use of its assets thus operational efficiency is adequately captured in the asset turnover ratio (Otuya & Omoye, 2021). This ratio measures the percentage of revenue generated from each naira of assets. The asset turnover gives a more encompassing measure of efficiency than other short-term efficiency measures (e.g. operating expense ratio). The ratio tests the productivity of capital investment expenditure by measuring the capacity actualization of the company in terms of the level of productivity in relation to asset usage.

Information and Communication Technology

information and communications technology refer to the infrastructure and mechanisms that makes computing possible. It is the meeting of digital and physical resources employed in data/information gathering, processing, storage, retrieval and dissemination. ICT is often used to encompass audio and visual processing, network-based control and monitoring activities, includes broadcastings, and intelligent building management systems (Otuya et al., 2021; Sangrulkar, 2019). ICT also infers the know-how which comprises of electronic devices and accompanying human communicating constituents that makes it possible for the user to deploy them for an extensive variety of use in education, commerce, banking, government, accounting, and personal necessities (Laudon & Laudon, 2001),.

Adoption of ICT has played an important part in the growth of the banking sector over the years. The implementation of electronic banking through the adoption of ICT has made the banking environment more innovative and competitive. Nwakoby, Sidi and Ofobruku (2019) explain that the increasing use of ICT in banking, has enabled banks to fulfill the needs of customers by strengthening the ability to offer a wide verity of products and services.

Theoretical Review: Technology Acceptance Theory

This study in anchored on the Technology Acceptance Theory. Davis, Bagozzi, and Warshaw (1989) used the TAT to illustrate users' degree of acceptance of towards information system or new technology. The model is premised on the fundamentals of perceived usefulness and perceived ease of use of information technology. On one-part, perceived usefulness is used to explain how an individual views adoption of new technology in enhancing service delivery. On the other hand, perceived ease of use describes how easy an individual learns how to operate or use new technology or information system. The TAT is considered suitable for this study because it emphasizes on how perceived ease of use (ICT adoption) would positively affect perceived usefulness (operational efficiency).

Based on the above theoretical framework and the hypotheses, the following conceptual model can be proposed:

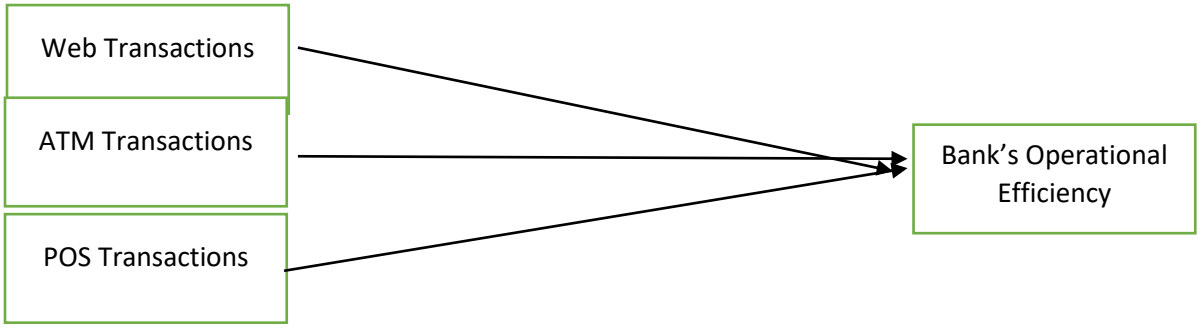

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Figure 1: Theoretical Framework
Source: Author (2022)

The above framework conceptualizes graphically the interaction between variables studied in this work. The study adopts three measures of ICT adoption practice namely: web payment transactions, ATM transactions and POS transactions as independent variables. Operational efficiency is used as dependent variable for the study.

Empirical Review

Empirical studies on ICT and banking are vast with divergent results. For instance, Nnwankwo and Agbo (2021) in a study of Nigeria's commercial banks examine the effect of electronic banking on the banks' performance using automated teller machine transactions, point of sale terminals transactions and mobile banking transactions as variables. The study covered the period from 2013 to 2017. The results of the study showed that ATM transactions have positive and significant effect on the performance of commercial banks in Nigeria while both POS terminal transaction and mobile banking transactions have negative and weak effects on the performance of the commercial banks in Nigeria.

Also, Nwezeaku (2020) studied the association between e-banking and the performance of Nigerian banks. Electronic banking was proxied by value of Point-of-Sale transactions while banking performance was proxied by customers' deposits. Engle-Granger cointegration model was used to analyse data for the sample period 2009 to 2013. The results revealed that POS is not cointegrated with both the savings and time deposits but are cointegrated with demand deposits.

Sulieman and Ahlam-Jebreen (2017) in another study investigated the effect of e-banking services on the customers' loyalty of Jordanian commercial banks. The e-banking services signified (ease of use, usefulness, cost of use, web site design, Privacy and accessibility). The study used random sample of 400 participants to examine the study hypotheses and achieve its objectives. The study found a statistically significant effect of the e-banking services on customers loyalty of commercial Banks in Jordan. As regards the dimension of accessibility, the study revealed an insignificant effect on customers loyalty. Agboola (2006) in his study on ICT in Banking operations in Nigeria using the nature and degree of adoption of innovative technologies; degree of utilization of the identified technologies; and the effect of the adoption of ICT devices on banks, found that technology was the main driving force of competition in the banking industry. The study documented an increase in the adoption of ATMs, EFT, smart cards, electronic home and office banking and telephone banking during the period of investigation. It further shoed that adoption of ICT improves the banks' image and leads to a wider, faster and more efficient market.

Another Nigerian study by Dabwor et al. (2017) explored the effect of ICT adoption on the competitive performance of banks in an emerging economy. The study adopted both inferential and descriptive design using a t-test. Findings of the study revealed that a positive relationship exists between ICT and banks performance in Nigeria. The implication is 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.

Oyinkola (2018) using Furst Bank of Nigeria Plc as a case study examined the impact of IT on banking

operations in the Bank. Primary data were collected through structured questionnaire as research instrument 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 study findings revealed that IT has greatly improved the growth and performance of Nigerian commercial banks and has led to increased customers satisfaction. In the same vein, Nwakoby, Sidi, and Ofobruku (2019) conducted a study with the aim of determining if the adoption of ICT such as ATM, POS, MM, WP and IBT in the Nigerian banking system has had a significant impact on the performance of DMBs in Nigeria and to analyze whether ICT usage can sustain the performance of DMBs in the long run. Return on equity (ROE) was used as a proxy for measuring bank performance. The ordinary least square (OLS) model was adopted to estimate the variables, while the scatter diagram was plotted to determine whether the structural model is linear or non-linear. Results of the study showed that the adoption of various forms of ICT has signficantly influenced the quality of banking operations, and has specifically increased banks ROE and information and communication technology usage can sustain returns on equity of deposit money banks in the long run.

3. Data and Methods

The entire 15 listed Deposit Money Banks in Nigeria constitute the population of this study. The sample size for the study was determined using the Yemane (1967) formula. The statistical formula is stated:

$$n = \frac{N}{1+N(e)^2}$$

Where: n = sample size, N = Population size, e = Level of significance (0.05).

Given the formula, a total of 14 DMBs were used for the study. The study employed time series data extracted from secondary sources and cover the period of 10 years: 2012 – 2021. The data were obtained from different sources, The data on operational efficiency were obtained from the audited financial statements while data on the adoption of ICT using e-banking services such as services offered and their respective values and volumes were obtained from the various CBN periodic reports. Both descriptive and inferential statistics were used to analyse data collected.

Measurement of Variables

Table 3.1: Measurement of Variables

SN	Variable	Acronym	Category of Variable	Measurement of Variable
1	Operational Efficiency	OPE	Dependent	Total Asset scaled by turnover for the period
2	Web Payment	WEP	Independent	WEP is described as an online service that transfer funds from a customer to another. WEP= Total value of web payment transactions in a financial year
3	Automated Teller Machine (ATM)	ATM	Independent	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 in a year

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4	Point of Sale (POS)	POS	Independent	POS is described as the total value of POS transactions in Nigeria. POS = Total value of POS transactions

Model Specification

The regression model adopted for data analysis is as follows:

$OPE_{it} = f\ (ICT\ Adoption)$……(i)

This can be stated in econometric form

$OPE_{it} = \beta_0 + \beta_1 WEP_t + \beta_2 ATM_{it} + \beta_3 POS_{it} + U_{it}$..... (ii)

Where:

OPE= Operational efficiency at the end of the financial year WEP = Web Payment transactions

ATM = ATM transactions; POS = POS transactions; e = Error term; i = sampled deposit money banks; t = financial year end; βo = Constant; β_1, to β_{43}= Coefficients of slope parameters.

4. Results

The data collected for the study is hereby presented in tables to show the descriptive and inferential statistics.

Table 4.1: Descriptive Statistics

	OPE	WEP	ATM	POS
Mean	0.233500	46420412	6.47E+08	2.22E+08
Maximum	0.514000	1.30E+08	9.87E+08	4.39E+08
Minimum	0.013000	1984535.	2.70E+08	9418427.
Std. Dev.	0.163822	51425911	2.80E+08	1.88E+08
Probability	0.709227	0.485074	0.579459	0.517751
Observations	**10**	**10**	**10**	**10**

Source: E-View Output of financial statement analysis

KEY: OPE Operational Efficiency; WEP – Web Payments; ATM – ATM Transactions, POS – POS transactions

The table 4.1 displays the descriptive statistics for the data. As observed, operational efficiency has a mean value of 0.233 per cent for the time examined. The maximum and minimum values for OPE for the 10-year period are 0.514 per cent and 0.013 per cent respectively. The standard deviation measuring the spread of distribution stood at 0.163 indicating considerable variations in the data series.

Similarly, web payment transactions (WEP) have a mean value of 4640412 for the time period examined. The maximum and minimum amount of WEP for the period was 1.30 and 1984535 respectively. The standard deviation measuring the spread of the distribution stood at 51425911 which is very large and indicates considerable dispersion from the mean and that the distribution is inclusive of years with significant variations in their web payment transactions.

Further, the descriptive statistics result from the table on the ATM transactions and POS transactions point to the fact that while the sampled DMBs had an average of about 6.47E+08 ATM transaction for the period under consideration (2012-2021); the volume of POS transactions within the same period under consideration stood at an average of about 2.22. The descriptive statistics also shows that during the period the maximum

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ATM transactions was 9.87 with the lowest being 2.70. The POS also recorded the maximum value of 4.39 and minimum value of 9418427 during the period. The standard deviation of 2.80 for the ATM transactions and 1.88 for POS shows that there is a wider dispersion in terms of ATM and POS transactions for sampled DMBs.

Table 4.2: Correlation Statistics

	OPE	WEP	ATM	POS
OPE	1.000000			
WEP	0.154571	1.000000		
ATM	0.016224	0.871164	1.000000	
POS	0.086222	0.747744	0.699256	1.000000

Source: E-View Output of financial statement analysis

KEY: ROA Return on Assets; WEP – Web Payments; ATM – ATM Transactions, POS – POS transactions.

The correlation statistics shows that OPE has a positive relationship with WEP (r=0.154571), ATM (r=0.016224), and POS (r=0.086222). The correlation also shows WEP that has a positive relationship with ATM (r=0.0871164), and POS (r=0.0747744). Finally, POS is observed to have a positive correlation with ATM (r=0.0699256).

Table 4.3: Regression Results

Dependent Variable: OPE
Method: Least Squares
Date: 05/25/22 Time: 11:50
Sample: 2012 2021
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.333735	0.216718	1.539952	0.1745
WEP	1.88E-09	2.76E-09	0.680893	0.5213
ATM	2.86E-10	4.71E-10	0.606703	0.5663
POS	1.18E-11	5.18E-10	0.022779	0.9826

R-squared	0.082155	Mean dependent var	0.233500
Adjusted R-squared	0.037767	S.D. dependent var	0.163822
S.E. of regression	0.192222	Akaike info criterion	-0.171161
Sum squared resid	0.221695	Schwarz criterion	-0.050127
Log likelihood	4.855807	Hannan-Quinn criter.	-0.303936
F-statistic	0.179018	Durbin-Watson stat	2.631602
Prob(F-statistic)	0.906836		

Source: E-View Output of financial statement analysis

The regression results of data estimation for the model are reported in Table 4.3. The model examines the relationship between ICT adoption and operational efficiency of DMBs in Nigeria. As observed, The OLS regression estimation shows an R^2 value of 0.0821 which suggests an 8.21% explanatory ability of the model for the systematic variations in the dependent variable with an adjusted value of 0.0377. The F-stat (0.179) and p-value (0.9068) indicates that the hypothesis of a non-significant linear relationship between the dependent and independent variables cannot be rejected at 5% level. For an evaluation of the effects of the explanatory variables on ICT adoption, we examine their slope coefficients. As observed, the coefficients of use of ICT in form of Web Payment, ATM and POS transactions all appeared positive but not significant at 5% (p>0.05).

Hypothesis Testing and Discussion of Findings

The regression estimates for hypothesis one which examines the impact of web payment transactions on operational efficiency of DMBs reveals a positive effect of WEP on OPE ($\beta_1 WEPit$ =1.88E, p=0.5213>0.05). The p-value indicates that the effect is weak. The result meets our a priori expectation although we expected a more significant effect on operational efficiency. The implication of the result is that higher the use of web payments by bank customers the higher assets turnover but not commensurate with the use of web payments. This result agrees with Nnwankwo and Agbo (2021), Sulieman and Ahlam-Jebreen (2017), and Nwakoby, Sidi, and Ofobruku (2019).

In testing the second hypothesis, the effect of ATM transaction on operational efficiency was subjected to empirical test. Results showed a positive but not significant effect of ATM transactions on operational efficiency of DMBs ($\beta_7 ATMit$ *=2.86E, p=0.5663, p>0.05*). This positive impact meets our expectations but we anticipated a much significant impact based on the spread of ATM across banks in the country. However, the

result is in agreement with prior studies such as Agboola (2016) and Nwakoby, Sidi and Ofobruku (2019).

Also, to examine the relationship between POS transaction volume and operational performance, the regression estimates from tables 4.3 were deployed for the model. The statistics shows positive but not significant association $\beta_6 POSit = 1.18E$, $p=0.9825$, $P<0.05$**)** which lend credence to state that a positive but insignificant effect of POS transaction on return on assets. The implication of this finding is that the volume of POS transactions affects the efficiency of banks but not a major determinant of its operational efficiency. The result meets our a priori expectation.

5. Conclusion and Recommendations

This study was conducted to examine the impact of the adoption of information and communication technology on operational efficiency of listed DMBs in Nigeria. The study, using the results of the regression statistics and exploratory variables in a model showed that web payment transactions, value of ATM transactions and POS transactions have a positive but non-significant effect on operational efficiency of the sampled DMBs. The study concludes that the adoption of electronic banking with the use of information and communication technology influences the performance of listed DMBs in Nigeria.

In line with the findings of this study, the following recommendations are proffered:

1. Deposit Money Banks in Nigeria should improve on their online payment networks so as to facilitate ease of payment among bank customers.
2. The study also recommends that DMBs should increase their ATM outlets especially the branches in the rural areas of the country to facilitate access to ATM services for all bankable public.
3. The study further recommends that banks should reduce the acquisition fee of POS machines by vendors. This will further expand POS services and thus improve customers satisfaction while increasing banks' operational efficiency.

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