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I. Title page
II. Abstract (150-250 words)
III. Keywords (3-5)
IV. Introduction
V. Literature Review
VI. Methodology
VII. Results and Discussion
VIII. Conclusion and Recommendations
IX. References (APA 7th Edition)
X. Appendices (if necessary)
XI. Author Biographies (optional)

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EFFECT OF INFORMATION COMMUNICATION TECHNOLOGY ON LIQUIDITY OF BANKS IN NIGERIA

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ABSTRACT

The study examines the effect of information communication technology on liquidity of banks in Nigeria using time series data of 2012 to 2021 which is gotten from the Central Bank of Nigeria's statistical bulletin. The study relied on the Ex-post facto research design. The Ordinary Least Square regression is used to test the hypotheses stated in the study. From the study findings, it is revealed that, automated teller machine transaction has a positive relationship and significant effect on liquidity ratio of banks in Nigeria. Furthermore, it is fund that, point of sales transaction has a negative relationship and an insignificant effect on liquidity ratio of banks in Nigeria. Lastly, the study result revealed that, Internet/internet transactions has a negative relationship and insignificant effect on liquidity ratio of banks in Nigeria. Thus, the study recommends that, the CBN and banks in Nigeria should ensure that regulations are made to sustain liquidity ratio of the banks and to ensure an effective and efficient ATM operation; where bank customers can continuously make financial transactions without hitches. This will further entrench e-banking practice in Nigeria which will help the banks cut cost of operations. Also, more enlightenment should be done by the banks about internet transactions to enable customers patronize alternative transaction channels as this will further improve the effectiveness and efficiency of customer service delivery by the banks.

Keywords: ICT, Innovation theory, liquidity, deposit money banks.

1.0 Introduction

In the Nigerian banking industry, the seamless delivery of customer service has emerged as a critical factor for success. Nigerian banks, like their counterparts worldwide, are facing an evolving challenge as they seek to strike a balance between providing exceptional customer experiences effectively through their liquidity (Siddik, Sun, Kabiraj, Shanmugan & Yanjuan, 2016). The phenomenon of liquidity has garnered increasing attention due to its far-reaching implications for the financial stability and competitive edge of banks operating in Nigeria. Also, the Nigerian banking sector has undergone significant transformation in recent years, marked by advancements in Information Communication Technology (ICT), regulatory reforms, and changing customer expectations. As such, customers are not only seeking secure and efficient banking services but are also demanding personalized and convenient experiences. Therefore, banks are expected to adopt ICT strategies that not only attract and retain customers but also ensure efficient liquidity to enhance their performance.

Liquidity is not solely confined to deposit and withdrawers by customers. It encompasses a broader scope, including digital platforms, self-service options, complaint resolution mechanisms, and other services geared towards facilitation of deposits and withdrawers (Ogunsakin, Babalola & Adedara, 2013). Exceptional liquidity ensures customer loyalty, positive word-of-mouth, and brand reputation. Conversely, poor liquidity can lead to customer attrition, reputational damage, and potential regulatory consequences which may lead to poor liquidity (Nwankwo & Agbo, 2021). Therefore, understanding the correlation between use of ICT tools and liquidity is pivotal for banks to maintain their financial stability.

Banks in Nigeria are facing a liquidity challenge due to their inability to effectively ensure customers are able to deposit or withdraw cash at their convenience. This challenge is due to increasing number of customers and the dearth in ICT infrastructures in Nigeria. From an onlooker observation, it can be noted that, the long queues at bank premises and banking halls are as a result of enormous number of customers seeking varying services with few banking staff to attend to them. Invariably, this situation is capable of

affecting the liquidity of banks as many customers may be unable to access various deposit and withdrawer services. As a result, banks resorted to Information Communication technologies like the ATM, Internet/Internet, and POS to offer increased liquidity to the customers but research evidence on how these ICTs have influenced liquidity is scanty and otherwise mixed.

For example, existing studies have demonstrated how Nigerian banks' adoption of ICT affects their liquidity and other micro performance indicators (Kabir et al., 2021; Nwankwo & Agbo, 2021; Madugba et al., 2021; Oniore & Okoli, 2019; and Abaenewe et al., 2013). These studies raise concerns about the justification for accepting ICTs, which is primarily about service delivery and dependent on enhancing banks' transactions and income at the micro level, as opposed to the most recent macro data on ICTs and how it affects liquidity of banks. Thus it portends to a methodological and theoretical gap in measurement of liquidity at the macro level. It is important to note that, liquidity can mostly be captured through a macro level by inculcating varying arguments and perspective to ICT and liquidity studies.

To make the contrasting argument clearer, the current study notes that, past scholars have used micro data which is not readily accessible as against macro e-banking data as capture by the Central Bank of Nigeria (CBN). Due to this methodological gap, it is necessary to investigate how ICT has affected the liquidity of Nigerian banks using CBN macro data to provide credence to the acceptance/legitimacy of electronic banking technology in the Nigerian environment. The main objective of this study is to investigate the effect of information communication technologies on liquidity of banks in Nigeria. Specifically, the study seeks to;

i. Assess the effect of automated teller machine (ATM) transactions on liquidity of banks in Nigeria.
ii. Analyze the effect of Point of Sale (POS) transactions on liquidity of banks in Nigeria.
iii. Determine the effect of internet transactions on liquidity of banks in Nigeria.

2.0 LITERATURE REVIEW

Information and Communication Technology: Technology generally refers to the application of knowledge for the execution of a given task. It entails skills and processes necessary for carrying out activities in a given context. Information technology, the technology that empowers information, is a term that generally covers the harnessing of electronic technology for the information needs of a business at all levels. It refers to the automation of processes, controls, and information production using computers, telecommunication software and ancillary equipment such as Automated Teller Machines, and debit card, (Khalifa, 2000). It was defined by the Nigerian National Policy for Information Technology (2001) as: computer, ancillary equipment software and firmware (hardware) and similar procedures, services ICT's Service & Operational Performance in Nigerian Banks. (including support services) and related resources, any equipment or inter connected system or subsystem of equipment that is used in the automatic acquisition, storage, manipulation, management, movement, transmission or reception of data or information". Today, a variety of ICT products are increasingly being used in the banking industry of the Less Developed Countries in response to increased sophistication of the customers and greater competition emanating from the increased globalization of the financial services industry.

In line with the concept of e-banking explained by Kabir et al., (2021), Nwankwo and Agbo (2021), Madugba et al., (2021), Oniore and Okoli (2019), the study's concept of e-banking transactions is framed on automated teller machine transactions, point of sales transactions and Internet facilitated transactions. Automated Teller Machines (ATMs) have revolutionized the way banks interact with customers and deliver their services (Agboola, 2006). In the realm of Information and Communication Technology (ICT), ATMs play a crucial role in enhancing customer service delivery by providing convenient, efficient, and accessible banking services. This technology has not only transformed traditional banking practices but has also ushered in a new era of customer empowerment and convenience (Agwu & Carter, 2014).

In the modern era of digital transformation, Information and Communication Technology (ICT) has revolutionized various industries, and one such prominent sector is banking. The integration of ICT, particularly Point of Sale (POS) technology, has brought about substantial changes in customer service delivery within banks. POS technology, initially known for facilitating retail transactions, has expanded its horizons to significantly enhance customer experiences in the banking sector (Mallat, Rossi & Tuunainen, 2004). Point of Sale (POS) technology refers to the system that enables transactions between a customer and a bank at the point of purchase or service. It encompasses both hardware and software components, including card readers, touch screen displays, software applications, and connectivity mechanisms. In a banking context, POS technology enables customers to conduct various financial activities conveniently, such as depositing or withdrawing funds, making bill payments, and transferring money (Nader, 2011).

The internet has revolutionized various aspects of our

lives, and one prominent sector that has witnessed significant transformation is the field of Information and Communication Technology (ICT) and customer service delivery in banks (Arnaboldi & Claeys, 2010). The integration of the internet into banking operations has not only streamlined processes but has also led to a paradigm shift in how banks interact with their customers. To Berger (2003), Information and Communication Technology forms the backbone of modern banking operations. The internet has played a pivotal role in enhancing various aspects of ICT in banks. According to DeYoung (2005), internet enables banks to efficiently manage and process vast amounts of customer data. As a result, Centeno (2004) stated that, it leads to quicker decision-making, personalized services, and improved risk management.

Liquidity: A bank's liquidity ratio is a financial metric that measures the institution's ability to meet its short-term obligations and withdrawal demands using its liquid assets. It reflects the proportion of cash and easily convertible assets, such as government securities, relative to the bank's liabilities (Olushola et al., 2020). A higher liquidity ratio indicates that the bank is well-positioned to cover immediate needs without resorting to expensive borrowing or asset sales, thereby reducing the risk of insolvency. Regulators use liquidity ratios to ensure financial stability, safeguard depositors, and promote confidence in the banking system by preventing liquidity crises and systemic disruptions (Lasmini et al., 2019).

Innovation Theory: The innovation theory of profit was propounded by renowned Austrian economist Joseph Schumpeter in 1939. Schumpeter's theory posits that innovation, particularly in the form of creative destruction and technological advancements, is the driving force behind economic growth, business success, and the accrual of profits. This theory revolutionized the way economists and business scholars understand the dynamics of capitalism and the generation of profits. This theory has significant implications for driving operational changes in banks when applied to the context of Information and Communication Technology (ICT) and liquidity in the banking sector.

Schumpeter's innovation theory identifies five types of innovation: the introduction of new products or services; the adoption of new production methods; the opening of new markets; the development of new supply sources; and the establishment of new industry structures. When examining the banking industry in the context of ICT and liquidity, these innovations play a pivotal role in transforming how banks operate and how customers experience their services in terms of deposit and withdrawers (Agwu et al., 2014).

In the context of customer service delivery, Schumpeter's theory emphasizes the importance of technological innovations to enhance liquidity. Utilizing the innovation theory of profit, Mawutor (2014) argues that, through ICT, banks can provide personalized and real-time customer interactions while also noting that, Chatbots, AI-driven customer support, and virtual assistants ensure that customers receive timely assistance and information, thus improving overall satisfaction. Similarly, Olushola, Halidu and Adekunle (2020) noted that, the banks digital self-service platforms now allow customers to perform routine transactions, such as fund transfers and bill payments, independently. This empowers customers and reduces their reliance on traditional customer service channels. The introduction of ICT have enabled banks to collect and analyze vast amounts of customer data. By leveraging data analytics, banks can gain insights into customer behavior, preferences, and needs, enabling them to tailor their services and marketing strategies accordingly. ICT also enables seamless integration of various customer touchpoints, such as mobile apps, Internetsites, social media, and physical branches. This ensures that customers can interact with the bank using their preferred channel, resulting in a consistent and convenient experience.

2.1 Review of related Empirical Studies

Scholarly works on the effect of Information Communication Technology on liquidity of banks has been done at a global level. Although there are paucity of literatures on ICT and liquidity, the study extrapolates literatures on ICT and performance of banks in view of accessing literatures on ICT and liquidity that are in line with extant literatures. These studies are reviewed in this section in a chronological order of the most recent year to the least.

The available studies cut across those done in Nigeria and the ones that are done outside Nigeria. Regardless of the empirical review of these studies, there seems to be a methodological gap in the model used by previous authors and a timeframe gap since there are very few or no studies done in 2022 and above. For example, Kabir et al., (2021), Nwankwo and Agbo (2021), Madugba et al., (2021), and Oniore and Okoli (2019) all used either ATM transactions, point of sales transactions, or Internet banking transactions but their studies failed to capture data beyond 2020 for liquidity. This enables a methodological gap that needs to be re-evaluated because there emerges evidence that liquidity can be capture at the macro level data which might alter past evidence and it needs to be studied. Also, these studies used micro level data that are not assessable in the annual reports of the banks. It is more reliable to use the macro level data available on the CBN data base which in this regard, the much available data for liquidity of the banks

pertains to the macro liquidity ratio of the banks.
Thus, the current study will adapt the models used by Kabir et al., (2021), Nwankwo and Agbo (2021), Madugba et al., (2021), Oniore and Okoli (2019), Abubakar et al., (2015) and use the recent ICT transactions and liquidity macro level data of banks to bridge the methodological gap that exist in previous studies.

3.0 Methodology

The ex-post facto research design is used in this study. This is a time series study so, the study population consist of 10 years macro data on banks in Nigeria from the CBN statistical data base. This consist of time-series data from 2012-2021 (a period of 10 years). The study uses the consensus sampling technique to adopt the 10-years' time-series data as the sample size for the study. The secondary data used are obtained from the published CBN statistic bulletin. This enabled the study obtain data for ATM transactions, POS transactions. Internet banking transactions, and liquidity ratio.

The study adopts the multiple (ordinary least square regression) model. Stata version 12 is used as the software for data analysis in this study and the estimation technique is based on ordinary least regression. The study equation is expressed in simple form as;

Liquidity ratio = f (automated teller machine transactions + point of sales transactions + Internet transactions) …… (i)

The study equation is expressed in the econometric form as;

$$LIQR_t = \alpha + \beta 1\ ATM_t + \beta 2\ POS_t + \beta 3\ INT_t + U_{it} \quad \text{…….. (ii)}$$

Where:

LIQR = Liquidity ratio (the total liquidity ratio as reported in the CBN bulletin 2021).

ATM= Automated teller machine transactions (the amount of money reported by CBN as transactions via automated teller machine by customers of the banks in a year)

POS= point of sale transactions (the amount of money reported by CBN as transactions via point of sales by customers of the banks in a year).

INT = Internet transactions (the amount of money reported by CBN as transactions via Internet/internet by customers of banks in a year).

β1 – β3 = Beta coefficient of the model

t= time series element of the model

U= Error term

The decision rule is to accept the null hypothesis if the calculated probability value is greater than the accepted probability value of 0.05.

4.0 Data Analysis and Discussion

The descriptive statistics for both the dependent and independent variables of interest is done in this sub-section. Each variable is examined based on the mean, standard deviation, maximum and minimum values. Table 1 below displays the descriptive statistics for the study.

Table 1: Summary Statistics

Variable |	Obs	Mean	Std. Dev.	Min	Max
LIQR |	10	58.662	18.95901	38.32	104.2
ATM |	10	8.87e+12	8.09e+12	1.98e+12	2.51e+13
POS |	10	3.60e+12	7.42e+12	4.85e+10	2.45e+13
INT |	10	7.82e+13	1.80e+14	3.16e+10	5.45e+14

Source: Authors' computation 2024

The study observed data for ICT and financial service provision of banks in Nigeria for 10 years as shown in the Obs statistics which represents the study number of observation. For data on macro liquidity ratio (LIQR) of banks, which represents the level at which banks facilitate deposits and withdrawers, the descriptive statistics reveal a mean value of 58.662 with a deviation of 18.95901. The result further reveals minimum and maximum values of 38.32 and 104.2 respectively for LIQR. The level of deviation shown in the data for LIQR reveals the level of fluctuation in liquidity ratio; which might be as a result of transactions facilitated through ICT mediums and other government financial policies.

The study finds that Automated Teller Machine (ATM) transaction has a mean of 8.87 trillion Naira and a standard deviation of 8.09 trillion Naira. This implies that on the average, the banking sector in Nigeria record about 8.09 trillion decrease or increase in customer transaction owing to ATM regulations. The minimum and maximum values for ATM are 1.98 trillion Naira and 25.1 trillion Naira respectively.
In terms of Point of Sales transactions (POS), the study finds that, POS transactions has a mean value of 360 billion Naira and the standard deviation is 742 billion Naira. Also, POS has a minimum and maximum values of 48.46 billion Naira and 24.45

trillion Naira respectively. Furthermore, Nigeria's data show a mean record of 78.2 trillion Naira for INT transaction which is inclusive of INT transaction. The INT also record a standard deviation value of 180 trillion naira. Lastly, the banking industry records minimum and maximum values of approximately 31.56 billion Naira and 545.04 trillion Naira respectively. The high level of fluctuation shown by data proves that in the past when INT and INT service were not mostly used by customers, there were low records of INT transaction but this has greatly improved in recent times.

Diagnostic test

A number of tests are carried out to ascertain if the data used in this study meets the requirements of the regression technique. They include, data normality test and estimation tests for regression. Each test is discussed below:

a) Normality Test

To test for the level of disparity between the data sect which might disrupt the outcome of the result or to ascertain the fitness of the data used for the study, the probability of Kurtosis test as data normality test

Table 1: Data normality Test Table

Variable |	Obs	LIQR	ATM	POS	INT
Prob>chi2 |	11	0.0226 (0.0226)	0.099(0.6518)	0.002(0.9059)	0.0020(0.07)

Source: Authors' computation 2024

The data normality test table revealed kurtosis probability values for; LIQR, ATM, POS, and INT as 0.0226, 0.099, 0.002, and 0.0020. The normality values are first, tested in their absolute state which showed that data for LIQR, POS, and INT are not normalized with their probability values less than 0.05. To correct this, the study logged the values for ATM, POS, and INT to see if the normality/stationarity can be corrected with their respective test outcomes placed in the brackets. After taking the natural logs of ATM, POS, and INT; the data set for all the variables reveal probability values that are above 0.05 which depicts normality when logged. The study could not log the values for LIQR since they are in their ratio forms.

b) Regression estimation test

Four tests are carried out to determine the presence or absence of heteroskedasticity, autocorrelation, multicollinearity, and overall model fitness of the variables used in this study. They are; Breusch-Pagan / Cook-Weisberg test for heteroskedasticity, Breusch-Godfrey LM test for autocorrelation correlation, the variance inflation factor (VIF), and the Fisher-statistics test. The results are presented in Table 4 below.

Table 3: Regression estimation test

	B-Pagan	B-Godfrey	VIF	F.Stat
ACP |	0.2323	0.7899	5.74	0.0300

Source: Authors' computation 2024

All the variables show a low multicollinearity issue at an acceptable mean VIF value of 5.74<10. The Breusch-Pagan (B-Pagan) test reveal a statistic of 0.2323>0.05 which depicts that the model is free from heteroskedasticity issues. Furthermore, the B-Godfrey test reveal a statistic of 0.7899>0.05 which shows that, the model is free from autocorrelation issues. Finally, the F-Stat value of 0.0300 revealed shows that, the model as a whole is statistically fit and can translate valid results for analysis.

Regression Result

In this model, the study relied on the subsisting result in regression estimation test to ascertain the extent to which Information Communication technologies (ICT) have affected the financial service delivery of banks in Nigeria. An OLS regression is done using the macro data on ATM, POS, and INT transactions against the macro liquidity ratio of banks in Nigeria. The estimation regression result is presented below.

Table 4: Model summary

R-squared	= 0.7522	Adj R-squared = 0.6283	
LIQR	Coef.	t	P>|t|
ATM	96.35237	3.66	0.011
POS	-27.63866	-1.93	0.101
INT	-2.192204	-0.50	0.633
_cons	-818.1293	-3.87	0.008

Source: Authors' computation 2024

The model summary table above, presents the regression result between LOG values of ATM, POS and INT against LIQR. From the model summary table above, the following information can be distilled.

The R^2 which measures the level of variation of the dependent variable (LIQR) caused by the independent variables (ATM, POS & INT) stood at 0.7522. The R^2 otherwise known as the coefficient of determination shows the percentage of the total variation of the liquidity ratio of banks can be explained by collective changes in ATM, POS and INT transactions. Thus, the R^2 value of approximately 0.752 indicates that 75.2% of the variation in the liquidity ratio of the Nigerian banking sector can be explained by a variation in e-banking (ATM, POS, & INT) while the remaining 24.8% (i.e. 100-R^2) could be accounted by other financial policies not included in this model like financial deepening measures.

The regression results as presented above to determine the relationship between ICTs and financial service delivery shows that, when the independent variables are held stationary or without the variable intercept model (Constant); the LIQR variable is estimated at -818.1293. This simply implies that, when all independent variables are held constant, there will be decrease in liquidity ratio of Nigerian banking sector up to the tune of 888.1293 units occasioned by factors not incorporated in this study. Thus, a unit variation in ATM will lead to increase in LIQR by 96.35237 units, also this increase is significant as the p-value of 0.011 < 0.05. A unit change in POS will lead to a decrease in LIQR by 27.63866 units but this change is also not significant as the associated p-value of 0.101 is greater than the accepted 0.05 p-value. Lastly, LIQR will decrease by 2.192204 units should INT transaction is varied by a unit but this decrease too is not significant because the associated p-value is 0.633>0.05.

Test of Hypotheses

The hypotheses earlier stated in this study is tested in this section, in line with the study stated decision rule in section 3.

H_{01}: Automated teller machine transactions has no significant effect on liquidity of banks in Nigeria.

The study regression test reveals a p-value of 0.011<0.05 for ATM against LIQR. This means that, the null hypothesis is rejected while the alternative is accepted. Therefore, automated teller machine transaction has a significant effect on liquidity of banks in Nigeria.

H_{02}: Point of sales transactions has no significant effect on liquidity of banks in Nigeria.

The study regression test reveals a p-value of 0.101>0.05 for POS against LIQR. This means that, the null hypothesis is accepted while the alternative is rejected. Therefore, point of sales transaction has no significant effect on liquidity of banks in Nigeria.

H_{03}: Internet transactions has no significant effect on liquidity of banks in Nigeria.

The regression test reveals a p-value of 0.633>0.05 for INT against LIQR. This means that, the null hypothesis is accepted while the alternative is rejected. Therefore, INT transaction has no significant effect on liquidity of banks in Nigeria.

5.0 Conclusion and Recommendations

From the findings of the study above, the following conclusions are made:

i. Automated teller machine transactions have a positive and significant effect on liquidity ratio of banks in Nigeria.

ii. Point-of-sales transactions have a negative and insignificant effect on liquidity ratio of banks in Nigeria.

iii. Internet transactions have a negative and insignificant effect on liquidity ratio of banks in Nigeria.

In line with the findings of this study, the following recommendations are made;

i. The CBN and banks in Nigeria should continuously encourage regulations to sustain and ensure an effective and efficient ATM operation, where bank customers can make financial transactions without hitches. This will further entrench e-banking practice in Nigeria which will help the banks to entrench financial

deepening and facilitate more liquidity and customer service delivery.

ii. The current cost of deposit and withdrawals using POS by customers are high and arbitral in Nigeria. The CBN could make policy that regulate the cost incurred by customers in accessing banking services through point-of-sales transactions. By reducing the operation cost, more customers might be willing to use the point-of-sale service which will in turn significantly improve the customer service delivery of banks in Nigeria.

iii. Also, more enlightenment should be done by the banks about internet transactions and risk measures put in place to mitigate internet fraud that affects customers when they use internet banking services. This will enable customers patronize alternative transaction channels as this will further improve the effectiveness and efficiency of the banks in delivering banking services to customers.

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