IMPACT OF AUTOMATED TELLER MACHINE ON BANKING SERVICES DELIVERY IN NIGERIA: A STAKEHOLDER ANALYSIS

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Abstract. The increasing adoption of automated teller machine (ATM) as a major payment system has redefined banking services both in Nigeria and internationally. This paper evaluates the impact ATM on the banking service delivery in Nigeria using descriptive and regression analyses on the value of ATM transactions and customer deposit series for the sample period ranging from January 2009 to December 2013. The results of descriptive statistics show that private sector saving deposits and private sector demand deposit series are normally distributed but the private sector time deposits and the value of ATM transaction are not normally distributed. The results of the ADF unit root tests show that the levels of the variables contain unit roots whereas their first differences do not contain unit roots. The regression results indicate that ATM transactions positively and significantly impacts private sector demand deposits in Nigeria but not private sector savings deposits and private sector time deposits. It is recommended that the monetary authorities and commercial bank enlighten the depositors on the usage of ATM machine through mass media such as, television, bill board and radio as well as paste directive posters at every ATM centres across the country.

Keywords: payment system. automated teller machine. banking services. customers deposits. Nigeria.

1. INTRODUCTION

Information and communication technology (ICT) has increasingly stimulated expansion of the banking networks and range of the offered services during recent years. All banking services, such as electronic payments, loans, deposits, or securities have become heavily dependable on information and telecommunication technology (Adewoye, (2013). This is the main reason why banks are the biggest users of modern technology equipment. Due to the complexity of banking services, every opportunity to speed up their performance or to make them more accessible for customers is very well welcomed by banks. However with improvements of the quality of services, the important question appears if this process can provide the economic values for banks? Unfortunately not every increase in the customers' satisfaction transfers into the higher bank profits, especially in the case of very expensive investments in technology like automated teller machines (ATMs).

Although every banking operation requires some technology applications, researchers vary on the subject of the relationship between the level of employed automated teller machines, and the value of the banking efficiency increase (see for example, Adeniran (2014). All researchers agree on the importance of ATMs for the further developments of the banking industry, but some of them have found lack of proportionality between the increase in the scale of technology utilization and the increase in banks profitability. Okoro (2014), for example, concludes that the automated teller machine (ATM), Point of Sale (PoS) terminals and Internet services are the major instruments used by the customers of the deposit money banks in Nigeria. Following the introduction of electronic banking and internet automated teller machines (ATMs) which are the initial cornerstones of electronic finance, the increased adoption and penetration of mobile banking and Internet banking has added a new distribution channel to retail banking: Internet/Online-banking.

Nigeria historically operated a cash-driven economy particularly in the consumer sector; however the economy has witnessed improvements over the years with the introduction electronic payment systems. This current state of sophistication in electronic banking system is comparable to other economies at the same level of development and has increased the move to cashless economy. The ATM payment system which, according to Oboh (2005), was first introduced into the Nigerian financial service sector in the late 1980s by Societe Generel Bank, First Bank and Equity Bank has in no small measure enhanced the electronic payment system. In addition, the Central Bank of Nigeria (CBN) has recently engaged in series of reformations aimed at both making the Nigerian financial system formidable and enhancing the overall economic performance of Nigeria so as to place it on the right path in tune with global trends. One of the major reforms is the Cashless Policy. The cashless policy is a new policy on cash-based transactions which stipulates a 'cash handling charge' on daily cash withdrawals or cash deposits that exceed N500,000 for Individuals and N3,000,000 for Corporate bodies. The policy aims at reducing not eliminating the amount of physical cash circulating in the economy, and encouraging more electronic-based transactions in Nigeria (CBN, 2012).

The aim of this paper is to analyse the impact of ATM on banking services delivery in Nigeria. The study concentrates on the one stakeholder – the bank customer. The analysis will not only be useful to the depositors and the bankers in Nigeria, but also to banking system regulators and future researcher. The depositors for instance, will understand the impact of ATM transactions on deposits. The findings of this paper will be useful to the commercial banks in Nigeria will be embodied in this seminar paper, will assist them evaluate their investments in the Nigeria as well expose the dynamic interrelationship between various types of deposits and ATM transactions. It will also aid commercial banks in making policies relating to ATM transaction. The study will also be useful to the regulators to the banking system in Nigeria as it will help in formulation of e-banking policies in Nigeria. Academics will equally find this workshop paper useful as it will serve as reference material for future research.

2. CONCEPTUAL FRAMEWORK AND REVIEW OF RELATED LITERATURE

The Concept of Automated Teller Machine

Automated Teller Machine (ATM), also known as a automated banking machine (ABM) or Cash Machine and by several other names, is a computerized telecommunications device that provides the

clients of a financial institution with access to financial transactions in a public space without the need for a cashier, human clerk or bank teller. On most modern ATMs, the customer is identified by inserting a plastic ATM card with a magnetic stripe or a plastic smart card with a chip that contains a unique card number and some security information such as an expiration date or CVV. Authentication is provided by the customer entering a personal identification number (PIN). Using an ATM, customers can access their bank accounts in order to make cash withdrawals, credit card cash advances, and check their account balances as well as purchase prepaid cell phone credit.

The major types of electronic cards in Nigeria include debit cards and credit cards. Debit cards are linked to bank customer accounts and offer immediate confirmation of payment while credit cards can be used for accessing local and international networks and were widely accepted in most countries, the underlying infrastructure and operational rules are often provided by global trusted service provider such as Visa and Master card, in addition to local lines. Debit cards are the dominant card mechanism in Nigeria.

ATMs are known by various other names including automated banking machine (ABM) in the United States, Automated Transaction Machine or Cashpoint in the United Kingdom, Money Machine, Bank Machine, Cash Machine, Hole-In-The-Wall, Autoteller after the Bank of Scotland's usage, Cashline Machine as in the Royal Bank of Scotland's usage, MAC Machine in the Philadelphia area, Bankomat in various countries particularly in Europe and including Russia, Multibanco after a registered trade mark, in Portugal, Minibank in Norway, Geld Automaat in Belgium and the Netherlands, and All Time Money in India (Jegede, 2014).

Using an ATM card (whether debit card or a credit card), bank customers can electronically access their accounts and withdraw funds, make payments and check balances. ATMs have eliminated the need to enter a bank for basic transactions and allow access to accounts at machines throughout Nigeria as well as in other countries of the world. Financial institutions started charging fees to use their ATMs in the mid-1990s, making the transactions very profitable for the host banks. ATM is located in banks and customers convenience areas. This allows customers to drive up and complete financial transaction without ever leaving the safety of their belongings. ATM are interconnected to allow anyone with a bank card, debit card, or credit card to have access anywhere in the world because each station is connected to an inter-bank network such as PULSE, PLUS, CIRRUS and LINK to mention but few.

In Nigeria however, efficient and effective provision of ATM services in Nigeria has been bedeviled with numerous challenges. One of the major challenges is

poor power supply not only slows down the speed of electronic transactions but also increases the cost of providing electronic banking services as most of the required ICT infrastructure, including ATM cannot function without electricity. These increase the waiting time per transaction, and banks pass the high cost to customers. Inadequate security is another major problem associated with ATM services. Inadequate security for both the ATM hardware and software is cause for serious concern. Also, many bank customers complain that sometimes when they go to withdraw with their ATM card, the machine will seize the card and/or debit their accounts without actually withdrawing the sum. Many of these customers are therefore discouraged from further use of ATM. Many of the ATM machine deployed in banks are out-dated ATM. The use of outdated ATM machines results in many problems for the ATM users. Many of the Nigeria population are not properly educated in computer and internet appreciation and literacy. These results in situation were such customers encounter difficulties in using ATM machines.

Despite these challenges, there are numerous benefits of ATM associated with the provision of ATM services in Nigeria. The first is that ATM allows for speedy completion of transaction, especially withdrawal even outside the country where the banker does not have a branch. It also reduces the number of customers' visit to their banks. The ATM makes it possible for a customer to withdraw from any bank close to him 24/7. ATM services reduce the amount of cash a customer carries around knowing he has access to money. This benefit has tremendously enhanced the country's move into cashless economy. In addition customers can pay their bills using ATM cards or even pressing some buttons to transfer money from one account to another. This has contributed in no small measure in reducing the rate of theft and stealing in the Nigeria as people do no longer move about with large amount of money.

Review of Related Literature

There is no doubt that we live in a world where technology dominates our everyday life choices and decisions. One of the greatest concerns of every business organization is customer satisfaction. In the banking industry, most customers are motivated by accuracy of records and timely service delivery they receive. This has not only made the banking industry sophisticated but dynamic and ultimately becoming complex in nature with the introduction and invention of the Automated Teller Machine (ATM). Thus, many studies have investigated the effect of the ATM payment system on banking industry. Adewoye (2013), for instance, observes that ATM is an innovative customer delivery service tool that offers diversified services such as cash withdrawals, funds transfer, payment of bills, etc. The use of ATMs as a customer service delivery strategy has enabled bank customers to transact banking business using a coded ATM card, wherever an ATM facility is located, customers can access their accounts at any hour of the day.

According to Adeniran (2014), among the development in the banking services delivery is the introduction of Automated Teller Machine (ATM) that intends to decongest the banking halls as customers now can go to any nearest ATM outfit to consummate their banking transactions such as: cash withdrawal, cash deposit, bill payments, and transfer of fund between accounts. The research made use of across-sectional survey design that questioned respondents on ATM services. The findings revealed that, the impact of ATM services in terms of their perceived ease of use, transaction cost and service security is positive and significant. However, the result also indicates that the impact of ATM services in terms of availability of money is positive but insignificant.

In a similar study Idris, (2014), is of the view that Automated teller machine (ATM) among others was one of the services introduced by banks with the objective of providing customers quick access to their finances, as well to reduce cost of such access. The research investigated the perceived customer satisfaction towards introduction of automated teller machine (ATM) in Nigerian banks. The researcher used questionnaires and descriptive statistics to analyze the study. This covered perceived ease of use, perceived accessibility and perceived security in order to measure customer satisfaction in relation to ATM service quality. The result indicated that the customers with agreed responses on perceived ease of use and perceived accessibility has higher mean and standard deviation, while the perceived security responses has higher mean and standard deviation of disagreed responses

Also, Komal (2009) examined the Impact of ATM on Customer Satisfaction, establishes that ATM services enhance operations and customer satisfaction in terms of flexibility of time, add value in terms of speedy handling of voluminous transactions which traditional services were unable to handle efficiently and expediently.

Massoud (2003) used a unique data-base from 1996 – 2001period to test the effect of ATM surcharges on large versus small banks. Specifically, they examined the impact of ATM surcharges on bank customer incentives to switch accounts, from smaller banks to larger banks, in order to avoid ATM surcharges. The studies find that ATM surcharges increase the market share of deposits of large banks and decrease the market share of the smaller bank. ATM surcharges also positively impact the profitability of larger, but not smaller, banks.

Ebiringa (2010) investigated on the effects of ATM infrastructure on the success of e-payment. The study is motivated by the apparent low level of satisfaction with the level of the e-payment services irrespective of the increased deployment of ATM by banks and the need to isolate the critical factors responsible for this. The study was principally based on primary data collected from users of the ATMs and a total of one thousand, one hundred and forty-one (1,141) users of ATM were sampled. The study used weighted scores of the responses to success factors identified in the literature that were analysed using the Factor analysis simulation model. The study concluded that the provision of adequate infrastructure such as power is critical for effective integration of the Nigerian banking system to the global network of electronic payment via ATMs.

Discussing on the positive impacts of Information and Communication Technology and its business value, Saloner and Shepard (1995) in a comprehensive research conducted by in USA within the time frame of 1971-1979 reveals that the interest of network effect is significant in utilizing an Automated Teller Machines (ATMs).

Mohammed and Dada (2014) observe that with the dawn of ATM in Nigeria, banks' customers now have access to financial transaction outside the banking hall such as public place without the need for a cashier or bank teller. ATM is designed to perform the most important functions of banks staff

through magnetic-stripe plastic card known as the ATM card, which is usually issued by the financial institution. The card contains a unique card number and some security information such as serial number, an expiration date, etc. The card is thus replacing cheque, personal attendance of the customer, banking hour's restrictions and as well as paper based verification

According to Steve (2002), ATMs are placed not only near or inside the premises of banks, but also in locations such as shopping centers/malls, airports, grocery stores, petrol/gas stations, restaurants, or any place large numbers of people may gather. These represent two types of ATM installations: on and off premise. On premise ATMs are typically more advanced, multi-function machines that complement an actual bank branch's capabilities and thus more expensive. Off premise machines are deployed by financial institutions and also Independent Sales Organizations (ISOs) where there is usually just a straight need for cash

Okoro (2014) examine the impact of automated teller machine (ATM), point of sales (PoS), Mobile and Internet service values on the intermediation efficiency of the Nigerian economy using multiple regression technique on time series data of 2006 – 2011. The study reports the following findings: that there is significant relationship between ATM, PoS, Internet service values and the intermediation efficiency of the Nigerian economy. However, the study also reveals that there is no significant relationship between Mobile service value and intermediation efficiency of the Nigerian economy within the period under study. He concludes that the ATM, PoS and Internet services are the major instruments used by the customers of the deposit money banks in Nigeria, and recommends that the banks should put more effort in advertising these products in Nigeria.

Ezejiofor (2014) assesses the effectiveness of electronic banking systems in enhancing service delivery in the Nigerian banking industry by analysing responses obtained from 89 respondents through questionnaire. He finds, among other, that electronic banking enhances the customer's satisfaction of easy access to their financial transactions. He recommends that all stakeholder should work together to sustain the electronic banking system in Nigeria.

Jegede (2014) investigates the effects of ATM on the performance of Nigerian banks using responses from questionnaire from a convenience sample of 125 employees of five selected banks in Lagos State with Interswitch network. The results indicate that less than the benefits, the deployment of ATMs terminals have averagely improved the performance of Nigerian banks because of the alarming rate of ATM fraud. He concludes that banks should strive to increase their security layers to subvert the tricks of web scammers.

3. RESEARCH METHODOLOGY

Model Specification

In order to estimate the impact of ATM on banking services delivery in Nigeria, we applied the simple linear regression model. Linear regression is an econometric procedure for predicting the value of a dependent variable from an independent variable when the relationship between the variables is linear. The linear regression model enables us to estimate the impact ATM (the independent variable) on banking services proxied by the customer deposits (the dependent variables). The principal advantage of linear regression is its simplicity, interpretability, scientific acceptance, and widespread availability. The linear regression model is specified as follow:

$$PSD = \alpha_0 + \alpha_1 ATM + \mu_{1t} \quad (1)$$

$$PTD = \beta_0 + \beta_1 ATM + \mu_{2t} \quad (2)$$

$$PDD = C_0 + C_1 ATM + \mu_{3t} \quad (3)$$

Where *PSD*, *PTD and PDD* are the private sector savings deposit, private sector time deposit, and private sector demand deposit respectively; *ATM* is the value of the ATM transactions; a_1, β_1, and C_1 are coefficients and the impact of ATM transactions on banking services; and μ_{1t} μ_{2t} and μ_{3t} are the stochastic error term at time *t* for equations 1 to 3. The *a priori* expectations of the explanatory variables are: $a_1 \geq 0$, $\beta_1 \geq 0$, $C_1 \geq 0$. The basis of these expectations is that ATM contributes

positively to provision of banking services, since a customer can access his deposit 24/7 without bothering about closure of banking hall and other restrictions.

Data

The data for the econometric analysis of this study are monthly series of private sector savings deposit, private sector time deposit, private sector demand deposit and the value of the ATM transactions. The data were obtained from Central Bank of Nigeria (CBN) statistical database on CBN website.

The period under consideration for the variables ranges from January 2009 to December 2013.

4. Empirical Results and Discussions

Descriptive Statistics

Figure 1, shows time series plots of the relationship between growth in the banking industry savings deposit and the value of automated teller machine (ATM) transactions in Nigeria. Notice that the growth rates of the value of ATM transactions show wide fluctuations from the average. In the last quarter of 2009, the value ATM transaction falls far below the average but rose in the first quarter of 2010. The movement of private sector deposits appears well-behaved except private sector time deposit that shows noticeable swings between the last quarter of 2011 and first quarter of 2012.

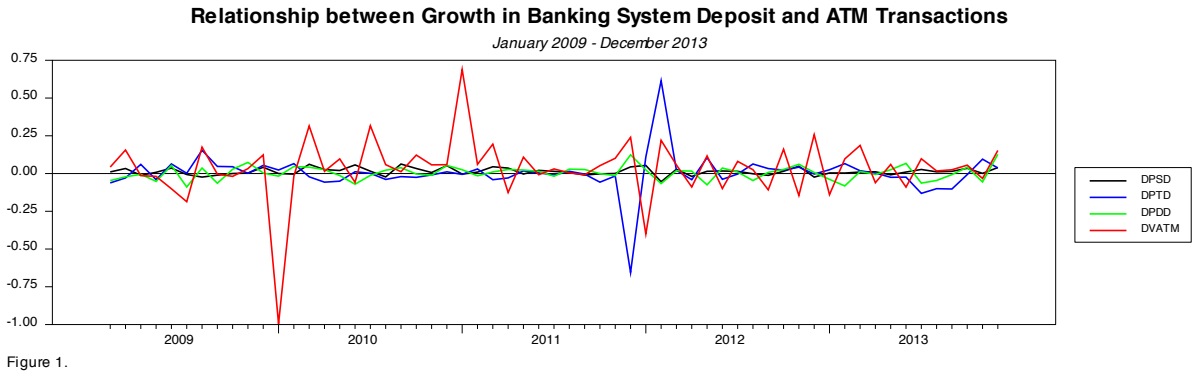


Figure 1. Relationship between Growth in Banking System Deposit and ATM Transactions (January 2009 – December 2013).

The estimates of the descriptive statistics are presented in Table *1*. Notice from Table *1* that the average of change are 1.33%, 0.36%, 0.41% for private sector savings deposit, private sector time deposit and private sector demand deposit respectively; whereas the average rates of change in the value of ATM transactions is 2.27%. This shows that the rate of change in ATM transactions is higher than the rate of change in banking service delivery in Nigeria. The standard deviation for private sector savings deposit, private sector time deposit and private sector demand deposit are all showing lower percentage of 2.38%, 12.87% and 4.58% respectively compared to higher 27.66% of ATM transactions. Hence, ATM transactions with higher rate of returns equally show wide dispersion from the average. The skewness of the private sector savings deposit, the private sector time deposit and private sector demand deposit are 0.0508, -0.4753 and 0.1324 respectively, while the rate of change in value of ATM transactions is -1.7916. Since Skewness of a normal distribution is zero (0), the skewness coefficient of private sector savings deposit, the private sector time deposit and private sector demand deposit are zero (0) and are in agreement with the assumption of normal distribution. However, the skewness coefficient of VATM is negative and significant, indicating evidence of deviation from normal distribution. Also, the kurtosis of a normal distribution is zero (0). The Kurtosis of the private sector savings deposit is 0.1559, the private sector time deposit is 19.7428 and private sector demand deposit 0.3980, while the rate of change in value of ATM transactions is 16.4108. Here, looking at the private sector savings deposit and private sector demand deposit has

normal Kurtosis distribution, while the private sector time deposit and the rate of change in value of ATM transactions show negative Kurtosis respectively. In addition, the estimates of Jarque-Bera statistics suggest that the private sector savings deposit and private sector demand deposit are normally distributed, but the private sector time deposit and the rate of change in value of ATM appear not to be normally distributed.

Table 1. Descriptive Statistics of Deposit and Value of ATM Transactions.

	Mean	Std. Dev.	Skewness	Kurtosis	J-B Stat.
Δpsd	0.0133	0.0238	0.0508	0.1559	0.0852
Δptd	0.0036	0.1287	-0.4753	19.7428	960.4282
Δpdd	0.0041	0.0458	0.1324	0.3980	0.5620
Δvatm	0.0227	0.2766	-1.7916	16.4108	693.6324

Stationarity Tests

Table *2* shows the results from the Augmented Dickey-Fuller Unit Root (ADF) test. The rule for the ADF unit root test is that the computed ADF coefficient should be greater, in absolute value, than the table value, at the chosen level of significance, for the series under study to be stationary. As can be seen in *Table 2* below, the calculated values of the ADF test statistics is less than the critical values at 5%, this indicate that at the level of all the variables are not stationary whereas the ADF statistics for growth of the variables reveal that the computed values are greater than the tabulated values thus indicate stationarity at first difference.

Table 2. Stationarity Test Results.

ADF Test for Level of the Variables		
	Critical Value 5%	**Computed Value**
Psd	-3.484	-1.593
Ptd	-3.487	-2.395
Pdd	-3.484	-3.182
Vatm	-3.484	-1.915
ADF Test for Growth of the Variables		
	Critical Value 5%	**Computed Value**
Δpsd	-2.912	-3.691
Δptd	-2.911	-7.509
Δpdd	-2.910	-8.296
Δvatm	-2.910	-7.957

Note: ADF lag length is selected using Akaike information criterion (AIC).

Regression Analysis

Table 3 displays the regression results of the value of ATM transactions on private sector savings deposit, private sector time deposit and private sector demand deposit series. As can be seen from table 2, the value of ATM transactions has positive and statistically significant on private sector demand deposit in Nigeria. This is evident in the positive coefficient of the ATM transactions (0.035) with *t*-statistic and *p*-value coefficients of 2.58 and 0.01 respectively. Similar evidence was not obtained for private sector savings deposit and private sector time deposit. The Durbin-Watson statistics show evidences against first order serial correlation all the estimates. The negative impact of growth in Market Capitalisation on the economy may not be unconnected with the crash in the stock market as a result of the global financial crisis, which started in the United States of America in 2007. This crisis results in over 70% erosion of the NSE capitalisation. Both institutional and individual investors lost large amounts of their investment in the NSE. It was during this period that about three banks were nationalized in Nigeria. It is therefore not surprising that growth in the NSE capitalisation did not impact positively on economic development in Nigeria.

Table 3. Impact of ATM on Private Sector Demand Deposit.

Variables	Savings deposit	Time deposit	Demand deposit
Constant	-0.184	0.629	0. 352
ATM coefficients	-0.007	-0.003	0.035
t-Statistics	-0.759	-0.185	2.587
p-value	0.450	0.853	0.012
Durbin-Watson	2.334	1.690	1.922

5. CONCLUSIONS AND RECOMMENDATIONS

This study investigates the impact of automated teller machine (ATM) on banking services delivery in Nigeria. The study concentrates on the one stakeholder – the bank customer. The data for the econometric analysis of this study are monthly series of private sector savings deposit, private sector time deposit, private sector demand deposit and the value of the ATM transactions. The data were obtained from Central Bank of Nigeria (CBN) statistical database on CBN website. The results of descriptive statistics show that private saving deposits and private sector demand deposits series are normally distributed but the private sector time deposits and the value of ATM transactions are not normally distributed. The results of the ADF unit root tests show that the levels of the variables contain unit roots whereas their first differences do not contain unit roots. The OLS regression results indicate that ATM transactions positively and significantly impacts private sector demand deposits in Nigeria but not private sector savings deposits and private sector time deposits. The study concludes that ATM has not sufficiently impacted banking service delivery in Nigeria. In the light of the importance of ATM services to development of e-banking services and achievement of the CBN Cash-less Policy, efforts should be geared towards removal of archaic ATM machines and installation of modern ones in line with development in ICT. Banks should provide increase customer education on usage of ATM machine through mass media such as, television, bill board and radio as well as paste directive posters at every ATM centres across the country.

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