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EFFECTIVENESS OF AUTOMATED TELLER MACHINE (ATM) AS ECONOMIC DRIVER IN A CASHLESS SOCIETY

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Abstract

Automated Teller Machine (ATM) is a computerized telecommunications device that provides the customers of a financial institution with access to financial transactions in public space without need for a human clerk or bank teller. Contrary to what is suggestive of the term, cashless economy does not refer to an outright absence of cash transactions in the economic setting but one in which the amount of cash-based transactions is kept to the barest minimum. It is an economic system in which transactions are not done predominantly in exchange for actual cash. It is not also an economic system where goods and services are exchanged for goods and service (the barter system). It is an economic setting in which goods and services are bought and paid for through electronic media and it has positive impact on economy if it positively practice. The banking industry has witnessed advancement in technology just like any other sector; the use of automated teller machine is one of these as it affects banking operation entirely. Adoption of self-service technology by the bank has led to continuous service of ATMs to the populace; they offer convenience to customers and provide banking service well beyond the traditional service period. The result shows that developed countries performed better in their cashless operations and policy. Barriers limiting cashless operations have been removed to the minimum if not completely and it has great positive impact on their economy while developing countries are far from being ready to follow this important attainment.

INTRODUCTION

Automated Teller Machine (ATM) is a computerized telecommunications device that provides the customers of a financial institution with access to financial transactions in public space without need for a human clerk or bank teller. Modern ATM identify the customer by inserting a plastic ATM card with magnetic stripe or plastic smart card with a chip that contain a unique card number and some security information such as an expiry date or CVC (CVV). Security is provided by the customer entering a personal identification number (P.I.N) (Edit, 2008).

Customers can access their bank account with the use of an ATM in order to make cash withdrawals (or credit card K2cash advances) and check their account balances. A mechanical cash dispenser was developed and built by Luther George Simjian and installed in 1939 in New York City by the City Bank of New York, but removed after 6 months due to the lack of customer acceptance (Olowoyo, 2012).

The ATM gets smaller, faster and easier over the year. Thereafter, the history of ATMS passed for over 25 years, until De LA Rue developed the first electronic ATM which was installed in Enfield Town in North London, United Kingdom 1967 by Barclays Bank. The first person to use the machine was the British variety artist and actor Reg Varney. The first ATM accepted only a single-use token or voucher, which was retained by the machine. These worked on various principles including radiation and low-coercively magnetism that was wiped by the card reader to make fraud more difficult. The machine dispensed pre-packaged envelopes containing ten pounds sterling. The idea of a PIN stored on the card was developed by the British engineer James Good fellow in 1965 (Olowoyo, 2012).

However, the modern network ATM was invented in Dallas, Texas; by Don Wetzel in 1968. Wetzel was a department head at an automated baggage-handling company called Docutel. In 1995 the Smithsonian's National Museum of American History recognized Docutel and Wetzel as the investors of the ATM. In recent times, the mobile phone is increasingly used to purchase digital contents (e.g. ringtones, music or games, tickets, parking fees and transport fees) just by flashing the mobile phone in front of the scanner at either manned or unmanned point of sales (POS). In Nigeria, as it is in many developing countries, cash is the main mode of payment and a large percentage of the populations are unbanked (Ajayi et al, 2006). This makes the country to be heavily cash-based economy.

Argument in favour of cash-based transactions abounds in the literature. A study conducted in UK in march 2010 (The future of cash in UK) argued that cash differs from other payment instruments in the following regards; it circulates, it is always valuable, it provides full and final settlement of a transaction, it allows for anonymity, the circulation of cash is uncontrolled once issued, it is regarded as public good by its users. However, the cost of cash to Nigeria financial system is high and increasing close to fifty billion naira in 2008 (CBN, 2012).

Recently, it has been revealed by the CBN that the direct cost of cash is estimated to have reached a staggering sum of one hundred and ninety-two billion naira in 2012. Other challenges resulting from high-cash usage among others include; robberies and cash-related crime, revenue leakage arising from too much of cash handling, inefficient treasury management due to nature of cash processing, high subsidy, high informal sector.

Edit (2008) analyse that ATM first came into wide UK use in 1973; the IBM 2984 was designed at the request of Lioyds Bank. The 2984 CIT (Cash Issuing Terminal) was the first true cash point, similar in function to today's machines; cash point is still a registered trade mark of 40yds TBB in the U.K. All where online and issued a variable amount which was immediately deducted from the account.

New technologies emerge in our society on a regular basis. The success of these technologies depends majorly on the degree to which they are adopted by the members of society. A version of Automatic Teller Machines (ATM) was introduced in 1969. Sutherland et al, 1978 cited by *Yaqub, 2013* stated that by 1976 more than 4600 ATMs were reported in operation in the United States and growing in excess of 100 units a month resulting in probably tens of thousands of ATMs throughout the world. Such growth suggests that ATMs are a successful new technology that has been adopted by members of society.

Before the introduction of the new technologies operation ATM into Nigeria's banking system with little practical action taken towards this objective, Nigerians have to spend longs hours in queues for taking care of even simple financial matters such as paying their utility bills, or transferring cash from one account to another. Currency notes, cheques and bank notebooks are the main pieces of equipment by which the banking system operates in Nigeria making it impossible to transfer cash via the banking system without having to encounter the clerk and filling many forms for both inter and intra-city transfers, with the process almost always taking several days (FG, 2011).

Money is often described as having three functions: (i) a unit of account function (ii) a medium-of exchange function and (iii) a store-of-value function. In a cashless economy, the third is not operative and, probably, neither is the second. Cashless economy does not refer to an outright absence of cash transactions in the economic setting but one in which the amount of cash-based transactions is kept to the barest minimum. It is an economic system in which transactions are not done predominantly in exchange for actual cash (Daniel et al, 2004).

A cashless society possesses the following characteristics, all the money used is issued by private financial institutions (banks, and possibly other firms). It is conceivable that the central bank continues to operate like other banks, issuing its own deposits that could be used as money in the same way as other bank deposits are. However, in that case the central bank has no monopoly in the issue of Money. In a cashless society the unit of account (e.g. Dollar, euro) remains a national affair and is provided by the state. The followings among others enhance the functioning of cashless economy; e-finance, e-banking, e-money, e-exchanges etc. In a modern economy, the use of noncash payment methods such as cards (credit and debit) dominates the use of cash in payments.

TYPE OF ATM

ATM are part of everyone's life. They ease the customer's day, by being in a variety of places, especially the drive-up ATMs. There are two types of ATMs, the built-in and the free standing machines. Each machine has its purpose whether it is for customers to drive up to or for easier deposits with a long teller line. Automated Teller Machines has varieties of options from the software, security for the user and the bank, bank

usage, cash dispensers and deposits and frees. ATM machines need to be reliable for the customer to feel at ease while using them (Olowoyo, 2012).

a) Built-in ATM

Automated teller machines come in two varieties; one of these varieties is the built-in ATM. This machine is generally found at the banks. They are built into the walls, so that the banks will have access from the rear of the machines and the customer is not privy to the security features. These built-in ATM machines appear as only a face to the customer with a place for a card, a printer for receipts, an area for deposits, a money dispenser, and a number pad. The built-in ATM often have a counter below or besides the machines for the customer to fill out the deposit envelopes. These machines are for walk-up customers, and they are not as handy as the drive-up versions of cash machines, they do have a purpose.

Banks that are located in grocery stores often find these built-in machines easier than a separate machine somewhere else in the store. As mentioned earlier, the back of the machines is on the other side of the wall, so the teller does not have to leave the area to top up the cash machines. Security is better, if the teller does not have to bring the cash dispensers in front of customer to restock or to do audits restaurants that only take cash. The drive-up ATM machine is definitely easy for customer. Customer will not have to get out of their cars to make deposits or withdraw cash; they can perform their transaction even when the bank is closed.

The security on these machines is not as easy for the teller when the teller needs to audit or restock the machine, they must enter codes to open the machines, use its internal computer to ascertain how much the cash the machines should have, and then withdraw the cash dispensers, while customers or others may be around. Most tellers will go out with a second teller to maintain security, taking two people from the teller line. The ATM representatives of the bank usually service the second type of machine. They will service the machine on their routes, making sure to restock the machine frequently. These machines are in public and security is again very important features.

b) Freestanding ATM

Freestanding ATM that are in malls and other businesses does not have the deposit feature. They are for cash dispensing only, and for the convenience of the public (Olowoyo, 2012).

HOW DOES AUTOMATED TELLER MACHINE WORK?

ATM (Automated Teller Machine) is a computer. It has a small display and a keyboard; it runs a program that is usually written by the bank. The program could do anything but banks usually follow a pattern. Most banks start by asking for language, they then ask you to insert your card. This card has magnetic strip on the bank that read information about your bank account (sort of like a diskette on a pc). It uses this information to look up your information and decides what to do next. When you enter your password, after that, it's up to program to decide what to do next.

As for the equipment, banks usually buy the ATM as a single piece but it is actually made up of components. There are different computer types but let's discus this

as if it were a pc. There would be several PCI slots. Each PCI slots would have a specialized card to support the equipment. One slot would be used for the modem (or network card) so it can be managed from the main office and can obtain information it needs from the central computer where most information is kept. Another slot would be for the card reader where you stick the ATM card in the money dispenser. The display and keyboard probably use the keyboard and display connectors.

ATMs and the supporting electronics financial networks are generally very reliable, with industry benchmarks typically producing 98.25% customer availability for ATMs and up to 99.999% availability for host systems. Whenever ATMs go out of service, customers could be left without the ability to make transactions until the beginning of their bank's next time of opening hours. Of course, not all errors are to the detriment of customers; there have been cases of machines giving out money without debiting the account, or giving out higher value notes as a result of incorrect denomination of bank note being loaded in the money cassettes. Error that can occur may be mechanical (such as card transport mechanisms; hard disk failures); software (such as operating system; device driver, application); communications; or purely down to operator error.

To aid in reliability, some ATMs print each transaction to a roll paper journal that is stored inside it allowing both the user of the ATMs and the related financial institution to settle things based on the records in the journal in case there is dispute. In some cases, transactions are posted to an electronic journal to remove the cost of supplying journal paper to the ATM and for more convenient searching of data.

Improper money checking cause the possibility of customer receiving counterfeit bank notes from an ATM, while bank personnel are generally trained better at spotting and removing counterfeit cash, the resulting ATM money supplies used by bank provide no absolute guarantee for proper bank notes, as the Federal Criminal Police Office of Germany has confirmed that there are regularly incidents of false bank notes having been provided through bank ATMs. Some ATMs may be staked and wholly owned by outside companies, which can further complicate this problem when it happens. Bill validation technology can be used by ATM providers to help ensure the authenticity of the cash before it is stocked in an ATM; ATMs that have cash recycling capabilities include this capability.

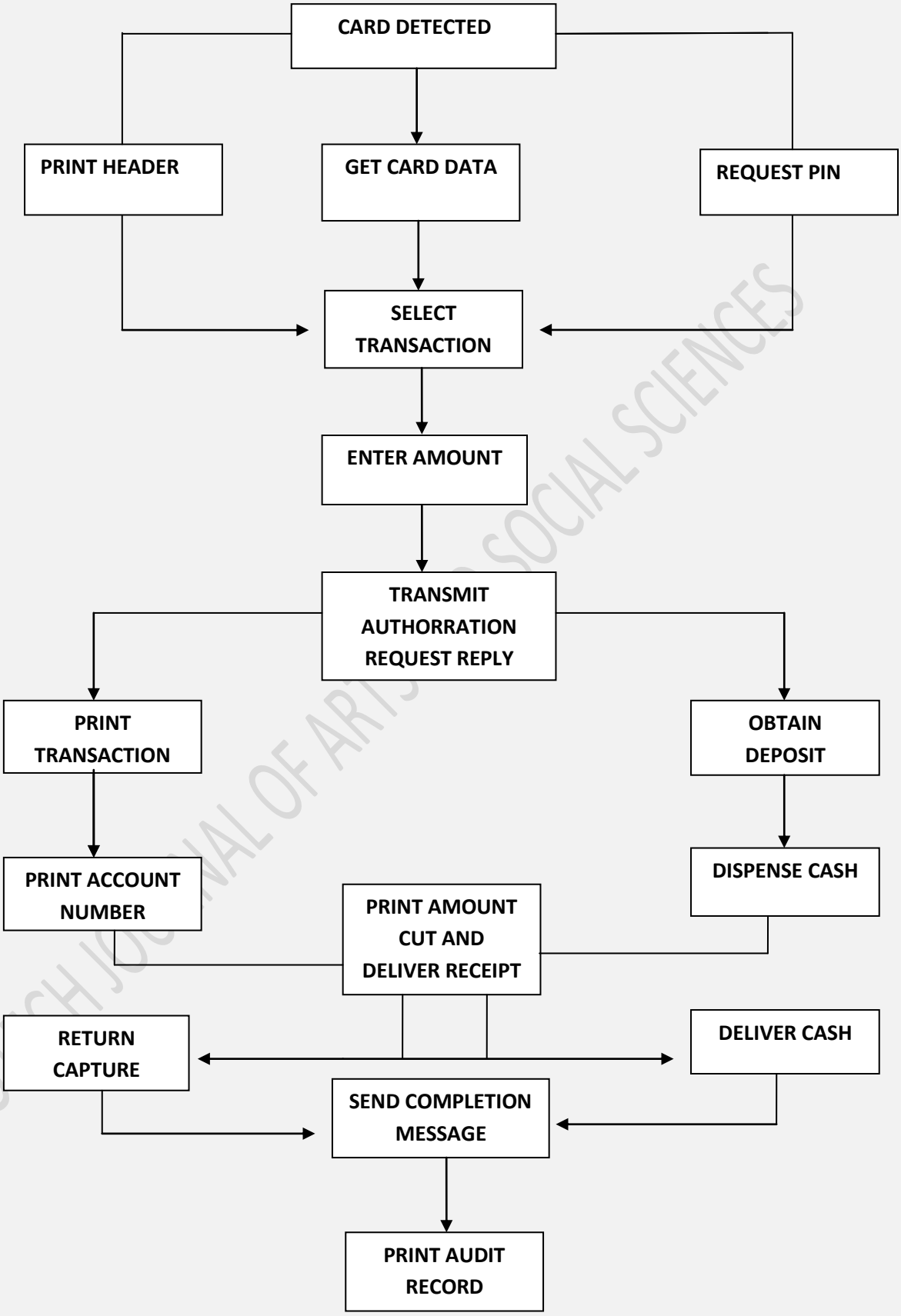

Fig 1: A Typical Transaction Flow Diagram of ATM (Babalola, 2008)

TRANSACTIONS DEMAND FOR CURRENCY AND OTHER PAYMENT INSTRUMENTS

Babalola (2008) discusses the transactions demand for cash. According to this model, the demand for cash depends on the value of transactions, cost of withdrawing cash and interest opportunity cost. Romer (1986) presents a general equilibrium version of the Baumol-Tobin model, in which money is both the store of value and the medium of exchange, and the consumer's cash holdings depend on the inconvenience of trips to the bank and interest rate losses from holding cash instead of higher-yield assets. The average deposit balance depends on the fraction of total transactions paid by cash, the expenditure, and the rate of return on the deposit account, the costs of transfer from the interest-bearing asset, and the cost of purchasing the commodity with demand deposits.

Babalola (2008) discuss the demand for media of exchange when there are an arbitrary number of payment instruments available. They analyse a representative agent model and state that the range of asset use decreases as household income decreases. Furthermore, the usage of payment instrument depends on the consumption patterns.

Uzor (2011) analyses the demand for currency and the demand for debit able accounts drawn on by check, debit card or credit card. In this model, the consumer makes purchases of various sizes, and the size of the transaction determines the means of payment used. The smallest transactions are paid in cash while transactions that exceed λ are paid with other means of payment. Whitesell (1992) analyses optimal service fees and deposit interest rates set by banks. Whitesell includes in his model currency, checks and credit cards, and discusses equilibrium under a monopoly bank and competitive banks. Shy and Tarkka (2002) cited by Uzor (2011) study the use of electronic cash cards, charge cards and currency. They analyse the costs of these three means of payment for both merchant and consumer sides. According to the results of this theoretical paper, in the absence of fees the smallest purchases are paid by electronic cash card, mid-size purchases in currency and the largest purchases by charge card. Another approach is to assume that the commodity itself determines which transactions are paid in cash and which transactions by card. In other words, some commodities must be paid in cash and some by credit. For instance, Lucas and Stokey (1987) cited by Moses-Ashike (2011) analyse the use of money with an aggregate general equilibrium model, assuming that there are two consumption goods – cash goods and credit goods – available each period. Lucas and Stokey state that one way to interpret credit goods is to define them as non-market goods, such as leisure.

White (1976) analyses the effects of credit cards on households' demand for money. He states that increased use of credit cards can be expected to reduce the amount of money needed for transactions. Duca and Whitesell (1995) also discuss the effects of credit cards on household money demand. According to their results, credit card ownership is negatively related to transaction deposits. Also, on network effects on cash-card substitution. They state that there is a unique relationship between EFTPOS coverage and the proportion of cash financed expenditures in equilibrium. Mulligan (1997) cited by Moses-Ashike (2011) analyses the use of cash by firms and finds that large firms hold less cash than small firms, relative to sales. Similar results are found by Moses-Ashike (2011) who use survey data on Finnish business firms and find that the

ratio of cash payments to total sales is considerably higher for small firms than for large firms.

Humphrey (2004) empirically study the use of cash and five non-cash payment instruments (check, paper giro, and electronic giro, credit card and debit card). They use data on 14 countries for 1987–1993 and conclude that countries generally move to increased use of electronic payment methods even when the mix of payment instruments differs considerably across countries.

Yaqub (2013) comments on the study of Humphrey et al (1996) and emphasises that the exogenous variables that cause the differences between payment systems are not self-evident. Judson and Porter (2004) analyse currency demand in the USA in 1974–1998. They find that currency demand depends on transactions, income, age distribution, bankruptcies, crime, employment, transfer payments and international currency demand. Virén (1993, 1994) discusses the demand for different payment instruments in Finland based on survey data.

Yaqub (2013) study the adoption of financial technologies. They state that the relevant question is whether people hold interest-bearing assets, not the fraction of such assets. The main factor behind the choice is the product of interest rate times the total amount of assets.

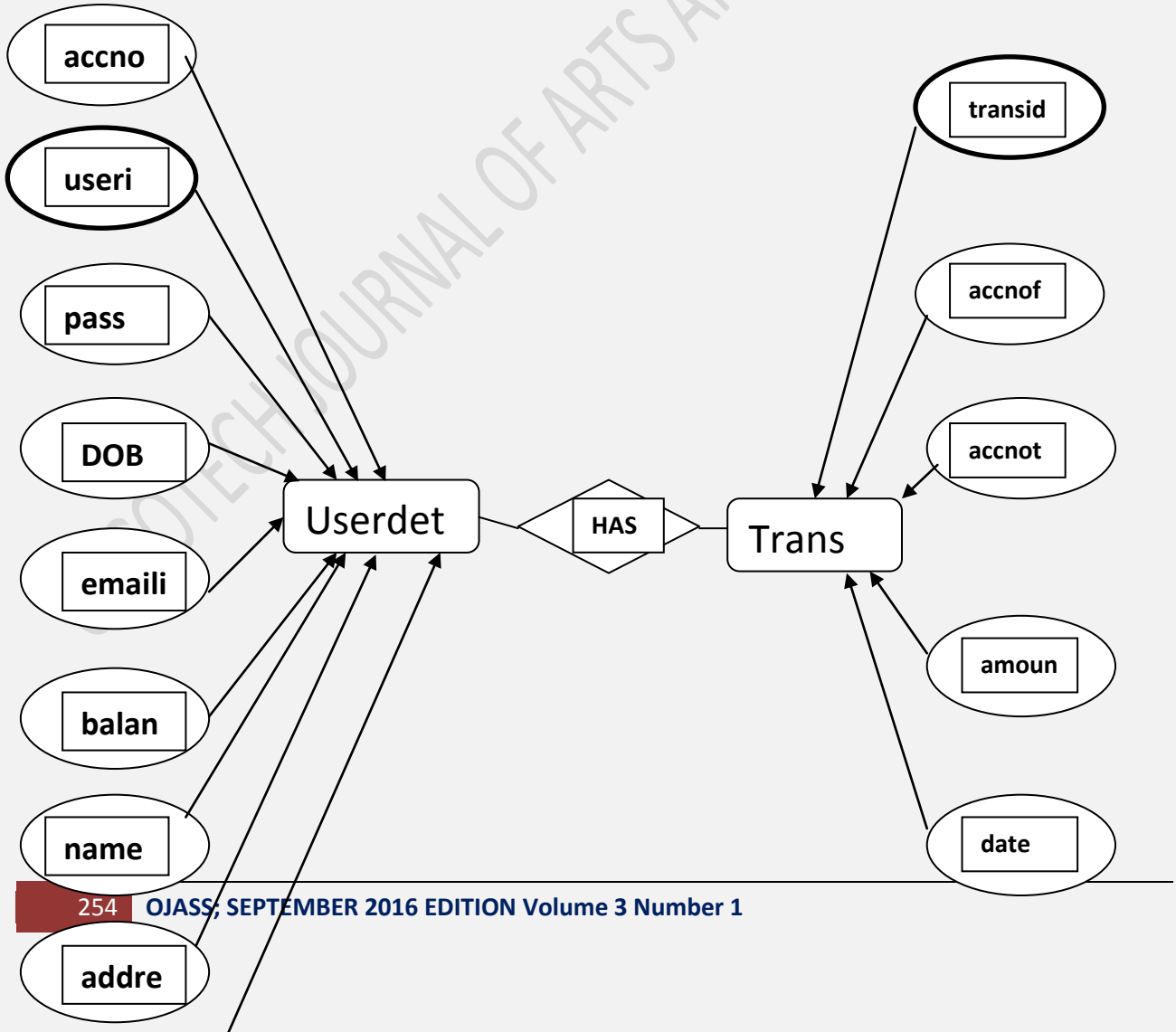

Fig 2: Entity Relationship Modelling of Cashless Transaction (Ramesh, 2012)

FACTORS OF THE CASHLESS SOCIETY

E-BANKING: This is the process of transfer of money online, to other account or sending of recharge PIN to mobile phone. From the customers' point of view, Aladwani (2001) found that electronic banking provides faster, easier and more reliable services to customers. However, customers are still hesitant to use electronic banking services, because they are concerned with security issues, and they may not have sufficient ability to deal with the applications of electronic banking (Kurnia et al, 2008).

POS: The World Payments Report 2012 stated that the global volume of non-cash payments has continued to grow by 7.1% annually; card usage has continued to grow while cheque usage has declined from 22% to 16% of all non-cash global transaction (Ayoola, 2013). With this machine in a supermarket you don't need to carry cash to shop once your ATM card is with you.

FACTORS THAT AFFECT CASHLESS POLICY IN DEVELOPED COUNTRIES

The following factors majorly affects the development of cashless operation in Nigeria and other developing countries:

(i) Power Failure and Communication Link: Constant electricity failure leads to deficiencies in infrastructures such as ATMs computers etc which slows down the rate of electronic transactions and also failure of links from NITEL lines which are as a result of sparks and surges caused by NEPA's inconsistent electronic power supply.

(ii) Lack of Computer Back-Up: As a result of lack of computer back-up when the bank system is corrupt there will be a loss of information about a customer, and this may lead to misappropriation of customers account, therefore the bank should have a manual backup (ledger) containing all data about the customers.

(iii) Lack of Adequate Investment Capital: Funds that can be used to buy new information technologies and for modernizing existing systems is generally in short supply. While there are a number of modern banking applications in use, there is also integrated banking system. Nigeria has continued to experience innovations in terms of product development specifically, there has been tremendous improvement in the speed in which funds are transferred within and outside the domestic economy (International Money Transfer).

(iv) Reduces Employment in the Country: Mobile Banking GPRS Telecom in the country today has reduced the rate of employments in the country whereby most works that should be done by human are done by machines thereby leading to low rate of employment and high rate of unemployment in the country.

(v) High Charges on Machines: The rate of commission or charges imposed by banks is too high thereby discouraging customers from using the electronic machine for

exchange of transactions. Example of such charges are cheques on withdraw ATMs and online transfer from one bank branch to another.

(vi) Low Public Acceptance: Customers and public in general do not have trust in the machine because of fraudulent personals uses of the system in carrying out fraudulent activities. Even banks of nowadays use the machine in looting customer's money from their accounts. Some customer complains that sometimes when they go to withdraw with their ATM the machine will seize the card while their account will still be debited with a particular sum during course of ratification of this problem, the customer might be discouraged because it will take a longer time or end up unsolved.

(vii) Insecurities in Banks: Most electronic machines today are not secure thereby making it easier for fraudulent personnel to carry out their fraudulent activities without been caught. Due to insecurity, banks cannot prevent or stop most fraudulent activity. Computer hackers also use the system in stealing data or information by breaking of codes (Humphrey, 2004).

(viii) Encourages Excessive Withdrawal: Un-operational days like Saturdays when banks are not in operation customers can go and withdraw with their ATM cards, especially when there is a function like wedding ceremonies, customers with little or no money can rush to a nearby ATM machine to withdraw money for excessive spending, customers complained about this in an interview conducted by banks.

FINDINGS AND DISCUSSION

CASHLESS IN SOME DEVELOPED COUNTRY IN PERCENTANGE

The factors that contributed to the growth of cashless operations in developed countries were neglected in developing countries; the following data are the result of a survey conducted. The data were collected through primary and secondary methods.

Table 1: Performance Evaluation and Result Discussion (Source: UN Survey 2015)

COUNTRIES	POS	NETWORK ACCESS	SECURITY	E-BANKING	ONLINE TRANSACTION
UAE	75%	66%	78%	77%	80%
USA	80%	93%	91%	90%	97%
UK	70%	77%	85%	59%	95%
INDIA	90%	80%	80%	85%	85%
NIGERIA	15%	10%	25%	30%	35%

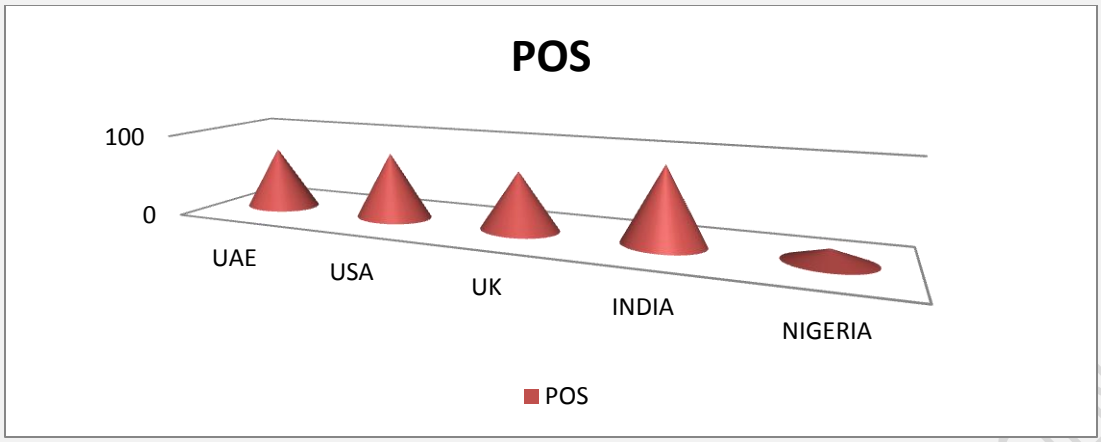

Figure 3: Graph of Point of Sale

According to the above graph, INDIA has the maximum of point-of-sale terminal (POS). Followed by UAE, USA and UK. While Nigeria has the lowest, interconnectivity challenge at the initial stage, but that has been addressed. And to ensure bandwidth availability in Nigeria, like other developed countries.

Figure 4: Graph of security

The pie chart above indicates that the problem of the security is usually in cashless society because the absence of internet security renders cashless insecure from the computer expert called “YAHOO BOY”. USA is the most secure country with 91% follow by UK with 85% and Nigeria is the least secured with 25%.

Security is clearly of crucial importance in considering any alternative to physical cash. At the root of this lies the problem of authentication, i.e. the process of verifying the identity of a person. This is typically performed by examining some identifying information such as a password or digital signature.

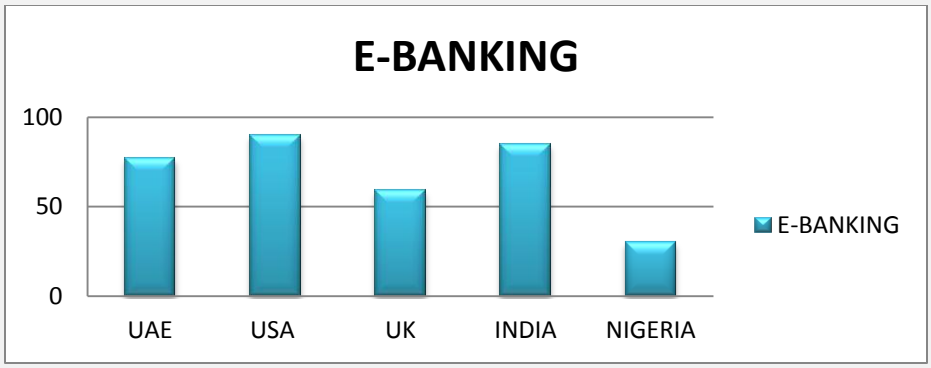

Figure 5: The graph of E-banking

From the graph, USA has the highest number of e-banking user. They prefer online banking because of the convenience attached to it, followed by INDIA and UAE. Inaccessibility of internet cannot allow Nigeria to meet up with other.

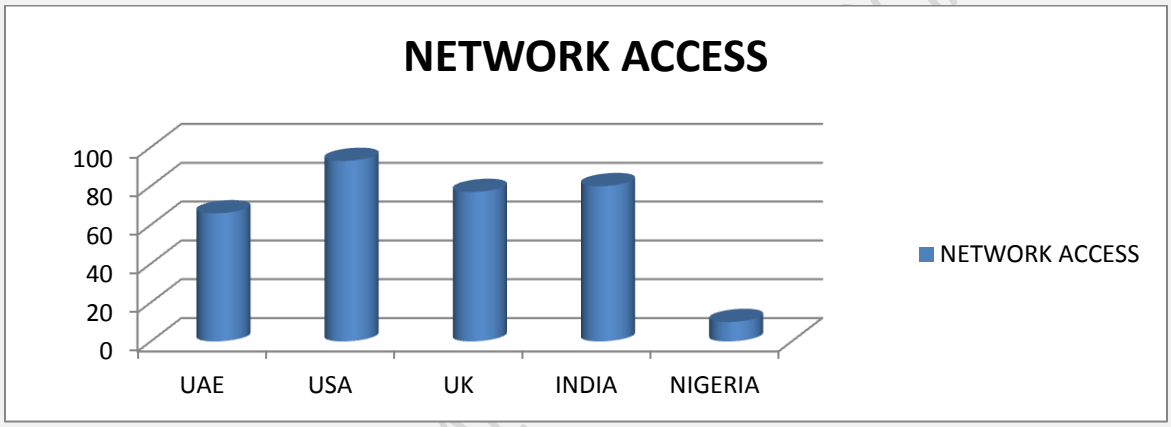

Figure 6: The graph of network access

The graph above shows that USA has the highest network access, follow by INDIA, UK, UAE and Nigeria with the lowest network access. The better the internet accessibility to general public, the higher the possibility of e-banking services to be accepted by potential customers and to be used more frequently by current customers.

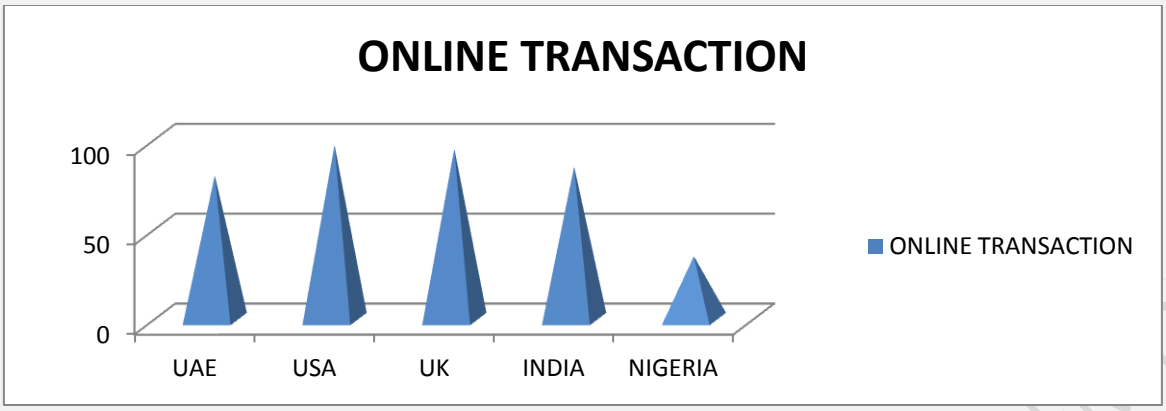

Figure 7: Online Transaction

With the graph above, USA has the maximum online transaction in daily routine, follow by UK, UAE, INDIA. And Nigeria has the lowest, because all the facilities needed for it is available compare to INDIA and Nigeria.

CONCLUSION

Since the decades that the first Automated Teller Machine was introduced in the United States, consumer's fundamental approach to their use has remained relatively unchanged-until today. According to industry observe, customers' primary use of ATMs continues to centre on cash withdrawals. Today, however, consumers are also securing needed cash in the context of point-of-sale (POS) purchases. As a result, banks and other financial institutions are re-examining the role and general value of the ATM, as more consumers are turning to debit and credit cards and automated payment transactions for ready access to their funds. Historically, consumers have embraced ATMs because the machines are accessible, easy to use and reliable. Consumers believe, moreover, that they are receiving values when they conduct ATM transactions. Technological advances, too, have made the typical ATM for more user-friendly by delivering a more personalized banking service experience replete with enhanced features and functionalities. The venerable ATM clearly demonstrates that convenience, high-quality user experience, consumer confidence, and the perception of value received are the four key attributes needed to make self-service attractive to consumers.

RECOMMENDATION

ATM is a new technology which is a channel of electronic fund transactions that accepts cards using different card-based technologies including magnetic stripe, microprocessor-based cards. ATM system is more convenient and involves no physical cash movement which can reduce the problems with cash based transactions such as fraud.

Any customer transacting with the ATM should be aware of the following in order to prevent their accounts from being compromised by fraudsters: (i) On approaching an ATM, you must be conscious of any individuals or groups suspiciously around or near the machine (ii) Before inserting card, take time to check that no strange devices appear

to have been attached, either across the actual card slot or anywhere else or adjacent to the machine. (iii) it is very important that no attempt be made by any member of the public to remove any article attached. Contact staff within the relevant premises immediately (bank/retail outlet/security? And ensure that police are contacted to arrest the situation. (iv) When using an ATM, always try to shield your PIN when keying it in.

For future improvement on this research work, the following are recommended: Design and implementation of ATM and Security implementation on ATM

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