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# Review of Cashless Economy in Nigeria and the Challenges of Network Infrastructures

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**ABSTRACT:** The central Bank of Nigeria (CBN) conceptualized the idea of Cashless Economy in 2011 as part of its blueprint to drive economic development and modernise our payment system in line with the Nation's Vision 2020 goal of being amongst the twenty most developed economies by the year 2020. The Apex bank of Nigeria then came up with a cashless policy with the view of pegging the amount of physical cash to be withdrawn or deposited at a time in commercial banks. The pilot scheme kick started in Lagos, Kano, Anambra and some other states of Nigeria's major commercial cities with intention of spreading across all the states of federation and the Federal Capital Territory (FCT). It was designed to reduce but not eliminate the amount of physical cash in circulation and encourage more electronic driven transaction channels. A number of researchers agree that this initiative by the CBN is anchored on the fact that an efficient and digitized payment system positively correlates with economic development, which is believed to be a key indicator for economic growth provided that all other factors are constant. This policy involves deployment of Information and Communication Technology (ICT) gadgets through Computer Network Infrastructures. The Policy aims at reducing cost of banking services, improving the effectiveness of monetary policy in managing inflation as well as driving economic growth and development. However, since its inception, the policy has witnessed a number of challenges such as transaction failures resulting from poor network availability, hidden bank charges by commercial banks and cyber crime attacks. This research, therefore, is an opinion paper in which the researcher presents the challenges facing cashless policy in Nigeria and as well as proffer solutions to the identified challenges. A good number of cashless transaction channels were equally discussed and these include Electronic Cards, Automated Teller Machines (ATM), Mobile Banking, Online banking, Point of Sales (POS), and Near Field Communication (NFC). However, they all seem to have a common challenge (Network failures). The study recommends Five Nines availability (Network uptime of 99.999 percent) and Mesh Network design topology amongst others as recommendations.

**KEYWORDS:** Cashless Economy, ICT, Network Infrastructures, Online banking

## INTRODUCTION

Economic growth and development are relative terms, but economic growth is possible without economic development as the former is demonstrated by an increase in Gross Domestic Product (GDP) and the latter is concerned with an increase in citizen's quality of life. In the words of Prateek (2019), quality of life is often measured using the human development index, which is an economic model that considers intrinsic personal factors not considered in economic growth, such as literacy rates, life expectancy and poverty rates. The researcher believes that what Nigeria has witnessed since her independent in 1960 has been that of economic growth and not development. As part of its blueprint in achieving both economic growth and development in Nigeria, the CBN introduced a cashless policy in 2011. This policy, since inception, has made the financial sector of the economy witness a tremendous change in order to accelerate easy production and trade of products and services using ICT enabled devices such as mobile phones, personal computer, Automated Teller Machine (ATM), Point of Sales (POS) and use of electronic credit or debit Cards for online payment for goods and services.

However, with increase in the development of financial systems, new ways of handling money appeared among banks and their customers. On a global scale, there has also been an increased awareness of the usefulness of Information and Communication Technology (ICT) driven by computer network infrastructures so as to enhance the rate of economic growth and development. ICT plays an important role in bringing about sustainable development in every nation where it has been properly deployed and implemented. The aforementioned assertion is in agreement with Dugeri (2013) statement in which he posited that without an optimal use of Information Technology (IT), no country can attain a speedy socio-economic growth and development. Global economies of the 21$^{st}$century have come to realize that no country can become competitive in terms of trade, industry, manufacturing and services among others without adopting, deploying, integrating and utilizing ICT in various sectors (Omotoso & Adelowo, 2014).

## Review of Cashless Economy in Nigeria and the Challenges of Network Infrastructures

There is no doubt that technological revolution and rapid development in Information and Communications Technology (ICT) has brought about many new opportunities and challenges for the global industrial sector. ICT, especially the Internet, is now an accepted operational element of most global industries and many enterprises may no longer perform without it. It is no longer news that most business transactions are now done online with little or no physical cash and interactions. This move where transactions can be done without physical cash is known as cashless economy which has been a major driver of economic growth and development all over the World. Before introduction of cashless policy in Nigeria by the CBN in 2011, banking operations in the country had been on the basis of individual bank's discretionary priority and there are lots of problems associated with a cash-based economy. The problems include money laundering, insecurity of cash in transition, delayed banking payments, and slow development in the country's economy (Agabonifo et al., 2012). According to a study conducted by Echekoba and Ezu (2012) as cited in Muyiwa et al (2013) about problems associated with cash based economy in Nigeria, it was observed that 68.2% of the respondent complained about long queues in the bank, 28.9% complained of bad attitude of tellers (cashiers) while 2.89% complained of long distance of bank locations to their homes or work places, but cashless economy through the advanced use of information technology drastically reduces time wasted in Bank(s) as well as addresses other hiccups noted by a number of researchers in the past .

Valentine (2011) cited in Agabonifo et al (2012) explains that the cost of minting the Naira is so high that the best alternative is to have an economy where less or no cash is required for various transactions. Studies equally revealed that the average cost of producing a Naira note is about four naira (N4), meaning that whopping sum of four billion naira (N4billion) is needed to mint one billion (N1billion) naira notes. The above figure excludes the cost of maintaining the notes which are subjected to different kinds of abuse. This partially explains why the CBN called for a cashless economy so as to reduce cost involved in minting and maintaining Naira notes amongst other economic benefits. And as part of sustainability measures to drive cashless economy, the apex bank in August 2019 rolled out "Clean Banknotes policy" which aims at mopping up mutilated naira notes in circulation. This simply means that commercial banks will no longer accept dirty and mutilated naira notes from customers at some point thereby invariably asking customers to go cashless.

The study further explains that the benefits of a cashless society to banks and merchants include larger customer coverage, reduction in cost of operations, international products and services promotion and branding, increase in customer satisfaction and personalized relationship with customers, easier to track documentation and transactions. Cashless policy, therefore, is not only essential to the development of Nigerian economy but has become top priority for Governments, Non-Governmental–Organizations (NGOs) and Corporate Bodies. Some means of e-payment Channels include the use of Electronic Cards, Automated Teller Machines (ATM), Mobile Banking, Online banking, Point of Sales (POS), Near Field Communication (NFC) and Electronic wallet (e-wallet). All these channels are effective means which have been adopted and there has been a remarkable progress as many Nigerians are going cashless daily.

However, it is important to note that in spite of successes recorded with cashless economy through the use of ICT gadgets, there has been a continuous and consistent complaints about availability of network resulting from poorly designed network infrastructures, hidden bank charges by commercial banks, cyber security to mention but a few. Given the above therefore, this paper focuses on the conceptual meaning of cashless economy, ICT and ICT network infrastructures. The researcher equally discussed different forms of electronic banking channels and challenges or hindrances militating against cashless economy policy which is perceived to usher in an era of massive economic and Infrastructural developments. Also extensively discussed are the solutions to Network availability and security issues.

### Clarifications of Cashless Economy, ICT and Network Infrastructure

The key concepts in the topic of discussion are the meaning of Cashless Economy, ICT and overall influence of Network Infrastructure on performance of cashless economy. The researcher, however, begins the discussion with the clarifications of these key concepts in order to present a platform for articulation of his views on the subject matter.

#### What is Cashless Economy?

Cashless Economy is an internet driven economic model in which transactions are not done predominantly in exchange for physical cash but involves an economic system in which payment for goods and services are carried out through ICT enabled devices. A 2003 report by CBN technical committee on e-banking defines Cashless economy as a means whereby banking business is transacted using automated processes and electronic devices such as personal computers, mobile phones, card payments and other electronic channels. It further states that banks practice electronic banking for informational purpose, some for simple transactions such as checking accounts balance as well as transmission of information, while others facilitate funds transfer and other financial transactions. Cashless economy is an economy where transaction can be done without necessarily carrying physical cash as a means of exchange of transaction but rather with the use of credit or debit cards to make payment for goods bought or services rendered (Muyiwa et al, 2013). Ochei (2013) defines cashless economy as cashless banking which involves electronic form of money transmission and further links it to a situation where banking services are fully automated such that transactions are concluded in a jiffy. Cashless economy is not the complete absence of cash but an economic setting in which goods and services are bought and paid for through electronic media. It can equally be seen as an environment in which money is spent without being physically carried from one person to the other.

## Review of Cashless Economy in Nigeria and the Challenges of Network Infrastructures

According to Dugeri (2013), a cashless economy is a society whereby credit cards, debit cards, charge cards, and direct transfer are used for making purchases. In a cashless economy, the payment for the purchases done is through the use of electronic cards or bank transfers.

Cashless economy is cost effective, growth friendly, business friendly and pro-financial inclusion. It aims at reducing the amount of physical cash circulating in the Nigeria economy and thereby encouraging more electronic–based transactions. This is in line with CBN Policy document of 2011, which states that the cashless policy is expected to reduce cost incurred in maintaining cash-based economy by 90% upon its full implementation in Nigeria.

**Information Communication Technology (ICT)**

The future of all businesses especially those in the service industries lie in Information Technology. ICT has changed the ways in which companies and banks compete. ICT which Stands for Information and Communication Technology refers to those technologies that provide access to information through telecommunications (Christensson, 2010).

Salihu et al. (2013) define ICT as the automation of processes, controls, and information production using computers, telecommunications, software and other gadget that ensure smooth and efficient running of activities. It is a term that largely covers the coupling of electronic technology for the information needs of a business at all levels. In the past few decades, ICTs have provided society with a vast array of new communication capabilities. Modern information and communication technologies have created a "global village," in which people can communicate with others across the world as if they were next door neighbours. For this reason, ICT is often studied in the context of how modern communication technologies affect society.

ICT has more recently been used to describe the convergence of several technologies and the use of common transmission technique carrying very diverse data and communication types and formats. Converging technologies that exemplify ICT include the merging of audiovisual, telephone and computer networks through a common cabling system or wireless technique.

The deployment of Information Communication Technologies (ICTs) facilities in the Nigerian banking industry has brought about fundamental changes in the content and quality of banking businesses in the country.

**Computer Network Infrastructure**

Network Infrastructure is the hardware and software resources of an entire network that enable network connectivity, communication, operations and management of an enterprise network. It is a category of information technology that is used to provide network services which allow devices to connect and communicate (spacey, 2018). Network infrastructure provides the communication path and services between users, processes, applications, services and external networks/the internet. Examples of network infrastructure include Routers, switches, hubs, bridges, servers, wireless access points to mention but a few.

Network Infrastructure is a vital component of modern business operations which ensures that businesses have effective connectivity, communication and management between users, equipment and external networks. It has become an inevitable avenue and failure to have an effective ICT network infrastructure in place can lead to dramatic inefficiencies for the businesses down the road. Therefore, having a network that supports business operations and technical goal requirements should be one of the top priorities and concern of financial sector and service industries like the commercial banks.

**Cashless Transaction Channels**

Cashless transactions are conducted through any of the under listed Channels:

**Electronic Cards (E-Cards):** These are cards that contain integrated circuits (ICs), which can process data and are used for conducting financial obligations. Electronic cards could be debit or credit cards. The difference between debit and credit cards is; debit cards are used for payment of purchases made and the money comes from the customer's account directly. On the other hand, payment for goods or service using the credit card is based on borrowing (Adigwe & Nwani, 2015). The most preferred debit cards used by Nigerians are the master and visa cards.

Globally, there has been an increase in adoption of contactless and real time payments through the use of electronic cards and other e-channels as the market share of cheques decline yearly. According to Nigeria Inter Bank Settlement System (NIBSS), there was a 22% decrease in total number of cheques returned in 2018 as compared to 2017. It further noted that the Asian-Pacific (APAC), China, South Korea and Australia recorded a 20% drop in cheque usage although India recorded a 10.1% increase in usage due majorly to her Government demonetization Policy. And in the US, cheque remains a Government backed phenomenon as it contributed a whopping 73.5% of global volume. The same source equally revealed that Nigeria Cheque transactions have continued on a downward spiral from its peak volume of 15.3m in 2014 to 9m in 2018. This is a -10% compound annual growth rate (CAGR) over the five year period; with a growth rate of -17% when compared to 2017, the source further reveals. Although, the volume of cheque transaction is decreasing, it is fair to say that its use is relevant, especially among larger value transactions, Bill Payments, and Payroll transactions. However, it is not pointless to say that this decline has been propelled by market forces amid growing availability of electronic cards and other e-channels and consumer's preference for faster payments, which can only be achieved through cashless economy.

**Automated Teller Machine (ATM):**

An ATM is an electronic banking outlet that allows customers to complete basic transactions without the aid of a branch representative or teller (Kagan, 2019). An ATM is operated with an electronic card. Therefore, anyone with a credit card or debit card can access it. Some of the services offered by an ATM include withdrawal of funds, account balance inquiry, transfer of funds, and top-up on airtime for mobile phones etc. Each card has a Personal Identification Number (PIN) which gives access to the account owner of the card. The first ATM that was offered to the public was in 1969 at the chemical bank in Rockville Centre, New York. ATMS were introduced into Nigeria in the year 1989. It was installed by national cash registers (NCR) for the Society General Bank of Nigeria. Since its introduction, many Nigerian banks have installed ATM in compliance with CBN Policy on cashless economy. A study conducted by Mohammed et al. (2014) reveals that ATM network availability contributes immensely to failed transactions by debiting customers' account without dispensing the cash. We also agree that one of the major problems of ATM failed transactions is often caused by poorly designed network and method of data transmission. Solving this problem, therefore, requires Network designers to always involve their potential customers and obtain their needs in terms of technical goals such as scalability, availability, network performance, security, manageability, adaptability, usability, and affordability

**Mobile Banking:**

Mobile banking is also called 'motion banking'. This form of E-Banking involves using mobile phones to carry out banking transactions. Mobile banking, according to Ayodele (2015) as cited in Ikefan et al. (2018) allows the customer to perform banking transactions at any time as long as a mobile phone is present. Mobile banking system offers information and other bank services to customers. This kind of e-channel does not require internet or data bundle for transactions to be conducted-meaning no form of data subscription is needed and are usually carried out using a certain code peculiar to ones bank. It is, however, not as secure as internet banking and transactions are subject to daily limits. Some of the services which are provided through mobile banking include account balance inquiry, payment of bills, short message service (SMS). It enables transactions to be done anywhere in the world and at the customer's convenience.

**Internet/ Online Banking:** This is a form of E-Banking whereby the internet is used for dissemination of information and also allows customers perform banking transactions (Ikefan et al., 2018). Programmable electronic devices such as computers and mobile phones that have access to the Internet are used for this process. It can also be seen as an electronic payment system that enables customers of a bank or other financial institutions to conduct a range of financial transactions through the financial institution's website or through mobile apps of a given bank, where usage of mobile phones are involved. When conducting E-Banking, customers' instructions are taken and then attended to via the same platform. One of the advantages of the Internet banking is that it helps reduce the cost of operations for banks, unlike traditional banks but could result to unemployment when the issues relating to network failures are fully resolved. Internet banking is mainly driven by either wired or wireless network technologies and transactions can be made via mobile phones, Point of Sales (POS) e.tc. It is more secure in comparison to mobile banking and amount of transactions per day are unlimited. However, transactions are mostly hindered by availability of network which often results to connectivity problems, delayed and failed transactions.

**Point of sale (POS):** This is a form of e-payment that handles balance inquiry, payment for goods and service, electronic fund transfer at a specific point of sale (Ikefan et al., 2018). Through insertion of electronic card, the device allows customers to make payment for goods and services purchased without the physical use of cash. Since it is an inter bank mode of payment system, internet connectivity is required for a successful transaction to take place. At POS terminals, when a customer slots in his card into the POS, he inputs his details and in the case of payment for goods or services, his account is debited at that point resulting in a transfer of funds to the service provider's account.

A report from NIBSS shows that Lagos state remains the top destination for POS transactions; accounting for 53% of total volume, Rivers State and FCT has witnessed marginal gains in 2018 when compared to 2017. On POS failed transactions, 15% of transactions failed in 2018 owing to network availability and other factors. While this figure is quite high based on regulatory, it is worth noting that 63% of these transactions were caused directly or indirectly by customer errors. According the same source, this errors span from customers selecting the wrong account option to debit to insufficient funds in the chosen account type. The organization noted that 46% of the total failed transaction was caused by the error "No sufficient Funds" '. This logically concludes that the remaining 54% was probably due unavailability of network.

**Near Field Communication (NFC):** NFC is a set of communication protocols that enables two electronic devices, one of which is usually a portable device such as a smart phone to establish communication by bringing them within 4cm (1 ½ in) of each other (Ortiz, 2008). Therefore, all NFC transactions take place within a very small area (anywhere from a touch to 4cm). NFC creates a new and universal interface to existing devices through simple touch interaction. It bridges the gap between existing technologies and devices to enable new applications/services. NFC is able to replace the pairing of Bluetooth enabled devices or the configuration of a Wi-Fi network through pins and keys by simply touching the two devices to be paired. NFC enables users to quickly and easily transfer information (contacts, photos, videos or files.) between devices with a simple touch.

**Electronic wallet (e-wallet):** E-wallet, also known as digital wallet refers to an electronic device or online service that allows an individual to make electronic transactions with the use of a computer or smart phones. An e-wallet needs to be linked with the individual's bank account to make payments. It can also be seen as a type of pre-paid account in which the user can store his/her money for any future online transaction and it is usually protected with a password. With the help of an e-wallet, one can make payments for groceries, online purchases and flight tickets, among others. This actually minimizes the chances of your bank account being hacked online because your credit or debit card details are not required during such transactions. Many banks now offer e-wallets for customers to make payments in one click, using their mobile phones. It is a safe, secure and convenient mode of making payments to service providers.

**BENEFITS OF CASHLESS ECONOMY**

The benefits of a cashless economy is enormous and financial experts have repeatedly pointed out the monumental gains in the cashless bank policy and notably among them is the idea that it will enhance the quality of life amongst the populace thereby driving economic development. They also believe that it will lead to the following:

i. Faster transactions – reducing queues at point of sales and banking halls

ii. Improve hygiene – through elimination of bacteria spread which comes from handling of mutilated bank notes. Just in September 2019 and as part of drive by the CBN to improve the overall quality of the naira notes in circulation, a clean note policy and banknotes fitness guidelines was introduced. This aims at mopping up mutilated and over-circulated banknotes to improve hygiene on sites.

iii. Simplify cash collection- time spent in collecting, counting and sorting of cash and vault balancing is eliminated

iv. Dependency on cash will be much reduced and people need not worry about theft- Extortion and bank robbery will also decline.

v. When transactions are digitalized, the details of income can be traced and thus income tax payments become mandatory. Thus, Cashless Economy helps in increasing revenue to the Government and eradicating financial leakages from various Government Agencies. This is also being strengthened by Treasury Single Account (TSA) initiative by the Federal Government of Nigeria.

vi. Electronic payment system ensures that people do not use counterfeit currencies. This reduces the chances of the economy being affected due to the circulation of large fake currencies.

vii. Also, the need for large denomination currencies does not arise if the people switch to electronic payments in large transactions. For the small transaction, coins and smaller currency notes serve the purpose. This reduces the burden on the government to print new currencies.

Given the above therefore, the CBN believes that, with the cashless system, there would be economic development in the country that would greatly enhance the extermination of corrupt practices, check money laundering and the security of cash in transit (Ochei, 2013). Also noted is the perceived impact on the naira where it is believed that the system will drastically reduce the pressure on the naira and cost of printing new notes which currently stands at four naira (N4) per note. So, every one billion naira printed attracts a whooping sum of four billion naira printing cost. Ezumba (2011) as cited in Ochei (2013) views CBN assertion from a different dimension and opines that the envisaged pressure on naira is only possible if there is effective and standard cross-border electronic transmittal system (. The aforementioned option is not off the table as Economic Community of West Africa States (ECOWAS) is thinking towards single currency which makes Ezumba's assertion valid.

Before the introduction of cashless policy in 2011, a number of researchers equally believed that the cashless system will reduce transfer/processing fees or bank charges, increase processing/transaction time, and offer multiple payments options and gives immediate notification on all transactions on customers account. According to Akhalumeh and Ohiokha (2012), bank merchants are major benefactors as the system ensures large customer coverage, international products and services, promotion and branding, increase in customer satisfaction and personalized relationship with customers, and easier documentation and transactions tracking. The idea of cashless transaction it was also believed will bring about greater interest in modern banking culture especially in a society where over 60 percent of banking populace are still enmeshed in the traditional mode of banking (Ochei,2013). This position was supported by Nonor (2011) when he asserted that cashless economy will nurture the culture of savings in the unbanked majority in the country. This study, however, is completely not in agreement with Nonor's perception because a close observation reveals that many, from the group of customers referred to above, have contrary views about savings when it comes to cashless transaction by their refusal to own ATM cards to avoid the temptation of regular withdrawals of their savings. Akhalumeh and Ohiokha (2012) toed the same line of thought as Ochei (2013) when they argued that most Nigerians are still unbanked and so a large proportion of the citizenry are not subjected to such monetary policy instruments as used in the banking system, and that this development will make CBN's policy tools more effective for achieving economic development and stability goals. The researcher is of the view that all the above research outputs have been witnessed but network challenges (failed transactions) have remained a major issue of concern and hence there is a gap that needs to be addressed.

While it is obvious that cashless policy might drive the economy positively, the researcher belong to that school of thought who believe that the relevant necessary conditions such as Five-nines percent (99.999% )network availability needed for sustainability of the policy is not yet on ground for some reasons. This evidently affects the policy as there have been cases of failed and delayed

transactions which often lead to mental stress and financial loses. According to another school of thought, the CBN attempt was akin to placing the cart before the horse. This again throws up the question of what are the conditions necessary for the sustainability and improved services if Nigerians are to optimally maximise the benefits of this viable ICT driven economic model. What could be done to technically resolve the issue of network failures in banking transactions? The answer to the question is simple. Five nines percent (99.999%) availability of network is the way to go but it is often expensive to achieve.

**E-CHANNELS RELATED CHALLENGES**

There are a number of challenges associated with a cashless society, and until they can be overcome, a 100 percent cash-free economy will still be a mirage. These challenges include:

**1. POS Problems at Pay Points**

The idea of using POS machines at pay points can be ruined when the POS machine, for instance, doesn't work, charge you twice, poor network or a faulty machine. All these and many more are serious cashless problems because what would you do when you picked all your items in a store and it's time to pay and they tell you, sorry our POS machine is not working. This is disappointing because you solely relied on POS, you didn't bring any cash with you. There are situations where you would be glad you went to a place with cash because you had encountered "our POS machine is not working" situation. Why? Because there is no network.

**2. ATM malfunctions**

ATM malfunctions is another common problem in Nigeria, which did not begin today. A lot of things can malfunction with an ATM withdrawal but the common ones are lack of service, a stuck card, ATM doesn't dispense cash but a debit alert was sent to you, a 'temporarily unable to dispense cash' feedback. ATM problems range from technical to operating system multitasking issues, which often lead to system deadlock, live lock or starvation. However, the most common hiccup remains availability of Network.

**3. Telecom challenges**

These are the challenges brought by telecommunication companies in charge of internet connectivity and communications or Internet service providers (ISP). In Nigeria, we have MTN, Airtel, GLO, 9Mobile, NTel, Swift, Smile, Spectranet, CobraNet, and MainOne to mention a few. Most issues on POS machines come from telecommunication companies because most of the excuses or reasons store owners/ attendants give is there's no network. If that's the case then we should blame telecom companies for that.

**4. Poor network connectivity**

Nigeria is not known to be one of the countries with the fastest internet connections. According to Speedtest Global Index for January 2018, Nigerian ranked 103 in the World with 10.28 Mbps (mega bytes per seconds) download speed. However, there is a green light at the end of a tunnel. Internet services are expected to improve in no distance time with introduction of fibre optics by GLO, an indigenous telecommunication company. This is known as marine one which is expected to provide fastest network backbone to other internet service providers like MTN Nigeria, Airtel and a host of other giant telecommunication firms in Nigeria.

**5. Poor power infrastructure**

This challenge is linked to poor power supply or poor facilities. Cashless payments are dependent on Internet connectivity which also depends on electricity so in a country with poor power infrastructure, cashless payment becomes challenging.

**6. Security and trust issues**

Cashless payments are gaining widespread popularity in Nigeria and beyond, but people are deeply concerned about the security risks associated with it. In recent years, glaring holes have been discovered in typical methods (Data encryption techniques) used for network security with respect to authentication mechanisms and data privacy. Given the above, some people are still sceptical or afraid of cashless payments such as online buying and selling, mobile banking, internet banking and so on. Some feel it is all a scam; they have so much fear that they don't even collect their ATM cards; they don't enrol in internet or mobile banking but prefer to go to banking halls, pick up a withdrawal and deposit slips, and wait in queue to collect or deposit their cash. The fact, however, remains that multilayered strategies, procedures, and implementations that provide security defence in depth are constantly being developed to strengthen emerging online security threats.

**What are the Solutions to Network Challenges?**

Technically speaking, it is quite evident that network failures have become a reoccurring issue as observed in all the e-channels challenges identified above. Cashless economy demands good network infrastructures but certain techniques are required while analyzing a customer's (in this case the banking sector) technical goals for a sound network design. This analysis helps network designers to confidently recommend technologies that will perform to the customer's expectations (Oppenheimer, 2006). The fundamental technical goals include scalability, availability, network performance, security, manageability, adaptability, usability, and affordability. The outlined technical goals come with tradeoffs. For example, meeting strict requirements for performance can make it difficult to attain the affordability goals. In other words, the issues associated with transaction delays and failures have

solutions but could be very expensive to achieve. Some of the solutions revolve around involving organizations whose businesses are driven by network to state their technical goals during Network design phase and those technical goals are as follows:

**Scalability**

This simply means how much growth a network design must support. There is every tendency of adding new users or customers, applications, additional sites, and external network connections at unprecedented rate. As part of having an effective and efficient cashless driven economy, the banks should be able to help their Internet service providers (ISP) understand how much the network will expand in the next couple of years or provide an insight for the network growth in the next 5 years as this will help in the area of network performance in terms of service delivery. According to Oppenheimer (2006), networking books and training taught 80/20 rule for capacity planning: 80 percent of traffic stays local in departmental Local Area Network (LANs) and 20 percent of traffic designated for external networks. However, this rule has become obsolete as many banks now own centralized servers. In addition, many banks increasingly implement intranet that enable employees to access centralized World Wide Web using Internet Protocol (IP) technologies. These web servers are centrally located, which breaks the classic 80/20 rules.

As good as the idea of scalability might sound, it is important to keep in mind that there are impediments or constraints to scalability inherent in networking technologies. Choosing technologies that can meet client's scalability goal is a complex process with significant ramifications if not done correctly. The problem lies on choice of network topology. A flat network topology with layer two switches can cause problems as the number of users scales, especially if the users' applications or network protocol send numerous broadcast frames to all connected segments. This, however, is not the case with mesh topology with alternative nodes for connectivity.

**Availability**

Availability is the amount of time a network is available to users and it is an important technical goal to be considered when thinking of solution to the issues surrounding failed and delayed transactions with regards to the cashless policy. Availability means how much time the network is operational. It is linked to reliability, but has a more specific meaning than reliability. Availability can be expressed as a percent uptime per year, month, day, or hour compared to the total time in that period. For example, in a network that offers 24-hours, seven days -a –week service, if the network is up for 165hours in 168-hours week, then the availability is 98. 21% (165/168 x 100). Consider the table below for further illustration.

**Table 1**

| Uptime hours per week | Down time per week | Availability (%) |
|---|---|---|
| **164.993** | 179 mins | 98.21% |
| **167.496** | 30 mins | 99.70% |
| **167.664** | 20mins | 99.80% |
| **167.916** | 5 mins | 99.95% |
| **167.998** | 0.1 mins | 99.999% |

From the table above, it is observed that the difference between an uptime of 99.70 percent and that of 99.95 percent is quite significant. An uptime of 99.70 percent means the network is down 30 minutes per week, which is not acceptable to many Financial Institutions, an uptime of 99.95 means the network is down 5 minutes per week, which may be acceptable. To ensure optimal performance, availability requirement should be specified with at least two digits following the decimal point. Five Nines availability (99.999%) is actually what is required to solve the challenges of network failures identified by many studies as a major bottleneck in cashless transactions. Five nines availability is extremely hard to achieve and this level of achievement requires redundant equipment, special network topology (mesh topology to be precise), and extremely reliable hardware and software. An uptime of 99.999 percent means that a network is unavailable for only 0.1 minute per week.

**Mesh Topology**

In order to meet availability requirements and improve network performance, network designers often recommend a mesh topology. In full mesh topology, every router or switch is connected to every other router or switch. It provides complete redundancy and offers good performance because every router has two or more links between any two sites. If one link is down, transmission of data will be routed through another link.

Although mesh networks feature good reliability, they have some drawbacks if they are not carefully designed. Mesh network can be expensive to deploy and maintain. It can also be hard to optimize, troubleshoot, and upgrade, unless they are designed using a simple hierarchical model. In non-hierarchical mesh topology, internetworking devices are not optimized for specific functions. Resolving network problems becomes difficult because of the lack of modularity.

**Security**

Security design is one of the most important aspects of network design and should be taken serious for countries considering cashless economy. Increased threats and vulnerabilities from both inside and outside an organization's network require the most up-to-date

security rules and technologies (Oppenheimer, 2006). An overall goal common to all banks on cashless policy drive is that security issues should not disrupt their ability to conduct businesses and offer services. Oppenheimer (2006) is of the view that a network should be designed in such way to offer assurances and protection against business data and other assets getting compromised or accessed inappropriately. Poor security implementations can upset users, causing them to think of ways to get security policies. It can also affect the redundancy of network design if all traffic must pass through encryption devices. A practical goal here is to ensure that the cost to implement security does not exceed the cost to recover from security incidents. In securing cashless transactions, one of the biggest risks that must be managed is the risk that a hacker can undermine the security of a network device such as router, server, or firewall. When a network device is compromised, the following threats emerge:

(i) Data flowing through the network can be intercepted, analyzed, modified, or deleted, thereby compromising integrity and confidentiality of data in transmission.

(ii) Additional and related network services, which relay on trust among network devices, can be compromised.

(iii) Authentication tokens like usernames and passwords can be compromised and used for further intrusions and perhaps to reach out and lunch attack on other networks.

(iv) Configuration of devices can be modified to allow unauthorised connections that shouldn't be allowed or to disallow legitimate connections.

Given the above therefore, many bank customers are probably scared of embracing cashless transactions because they are worried about hackers using protocol analyzers to sniff packets and reveal passwords, credit card numbers, or secret codes (Adigwe, 2018). This fear is yet to be erased from the minds of bank customers. They actually fail to understand that Credit and debit card numbers always sent via the internet are encrypted, using technologies such as the Secure Socket Layer (SSL) protocol. Authentication token such as passwords are also sent encrypted and are often good for only one use, where one-time passwords (OTP) are involved. Research equally revealed that even when passwords or electronic cards are not encrypted; it is extremely difficult to find these minute pieces of data in the midst of millions of sniffed packets. Also, to steal relevant packets, a hacker needs to physically and not remotely access a link that carries relevant traffic or needs to have compromised a switch that supports port monitoring.

In addition to attacks by hackers, network can also be compromised by activities of inadvertent user errors, including the downloading of software from illegitimate sites that introduce Trojan horses. Attacks may also come from malicious acts by internal users, including employees disgruntled by cost cuts, employees who become greedy during tough economic meltdown, as witnessed in Nigeria a couple of years back, and employees with a political agenda (Oppenheimer, 2006). The solution to all these manners of attack is for organizations involve in cashless policy business to have information security training and awareness programs to mitigate the risk of internal user attacks.

## CONCLUSION

In conclusion, saying that the number of cashless transactions has increased drastically is to state the obvious because study by NIBSS reveals that there was a 22% decrease in total number of cheques returned in 2018 as compared to 2017 which extensively shows that Nigeria populace are beginning to key in to cashless transactions. There is no doubt that Nigerians are beginning to reap the benefits of Cashless Economy as it is a common sight nowadays to observe Nigerians using electronic means to make payments and this has even created jobs as every knock and cranny of the country are gradually dominated by POS Merchants. Cashless economy has come to stay and will gradually drive the economy but achieving vision 2020 was not feasible. Nigeria Government is found of always shifting the goal post and has abandoned vision 2020 after failed attempt and now dreams of Agenda 2050.

However, Challenges of network availability leading to increase in number of delayed or failed transactions, epileptic or poor power infrastructures, Cyber security issues amongst others are some the factors to contend with while sustaining the gains made so far in pursuit of cashless economy. Having critically taken a look at the noble idea of cashless economy policy and the banking sector, it is contention of this paper that the policy is highly noble and commendable. Solutions have also been proffered on the best way to deal with the common challenges of Network availability and cyber security issues, which have become a clog on the wheel of progress of electronic driven transactions in Nigeria. There is also an urgent need to fast track enactment of cyber security bill before the floor of National assembly to tame information and communication technology propelled financial crimes.

## RECOMMENDATIONS

(1) This study and many other studies repeatedly revealed delayed and failed transactions as one of the major challenges affecting cashless economy, which was introduced by CBN in 2011. It is actually attributed to poor network infrastructures and the study recommends that banks as entities should be given opportunities to make their technical goals known to computer network designers. The technical goals involve scalability, availability, network performance, security, manageability, adaptability, usability, and affordability.

(2) Also noted as the way forward is to have Five- Nines percent (99.999%) network availability, which if often very expensive. An uptime of 99.999% simply means that network is down for only 0.1 minutes per week, which definitely eliminates the issue of network failures, provided that power is constant.

(3) For redundancy and reliability purpose, a wireless Mesh network topology design is also recommended. The mesh network topology is that which provides multiple paths between network nodes to ensure quick network recovery. And when one link is down, transmission of data continues through other routes.
(4) On the issue of Security, both Legislative and Executive arms of the Government have roles to play. The Executive, through the CBN, should involve cashless policy business to have information security training and awareness programs by commercial banks to mitigate the risk of internal user attacks. The National Assembly, as matter of urgency, needs to enact a stiff legislation to tame information technology propelled financial crimes.

**REFERENCES**


1) Adigwe, A.I. (2018). The Role of Network Traffic Analysis Tools in Education & Cybercrime Fight: Journal of Education and Emerging Issues (JEEI), 1(1): 34- 42
2) Adigwe, A.I. & Nwani, E.C. (2015): Introductory Computer and Basic Operations, Emuban Resources
3) Agabonifo, C. O., Adeola, S. O.& Oluwadare, S. (2012). An Assessment of the Role of ICTin the Readiness of Nigerian Bank Customers for the Introduction of Cashless Transactions. International Journal of Computing and ICT Research: https://www.researchgate.net/publication/286450909_An_Assessment_of_the_Role_o
4) Akhalumeh, P. & Ohiokha, F. (2012). "Nigeria's Economy: The Imperatives." International Journal of Management & Business Studies 2(2): 4-6
5) Ochei, V.O. (2013): Cashless Economy and the Nigerian Banking System, a Lecture Delivered at the CBN-Delta State Banker's Clearing House Award Ceremony.
6) Central Bank of Nigeria (2011). Towards a Cashless Nigeria: Tools & Strategies. Nigerian Journal of Economy, 3(2), 344 – 350.
7) Christensson, P. (2010). ICT Definition. Retrieved from https://techterms.com
8) Dugari, M. (2013). Cashless economy in Nigeria:Issues, Challenges and Prospects. https://mikedugeri.wordpress.com/2013/03/21/cashless-economy-in-nigeria/
9) Ikpefan, O. A., Akpan, E., Godswill, O. O., Grace E., & Chisom,N. (2018). Electronic Banking and Cashless Policy in Nigeria. International Journal of Civil Engineering and Technology (IJCIET), 9(10), 718–731. http://www.iaeme.com/IJCIET/issues.asp?JType=IJCIET&VType=9&IType=10
10) Kagan, J. (2019). Automated Teller Machine (ATM). Retrieved from https://www.investopedia.com/terms/a/atm.asp
11) Mohammed, M., Mohammed, A. & Aghoyone, A.S.(2014). The Effects of Customers Experience on ATM Refund System for Failed Bank Transactions: A Study of Deposit Money Banks in Maiduguri, Borno State, Nigeria. International *Journal of Business and Management (IJBM), 11(16), 50-67*
12) Muyiwa, O., Tunmibi, S. &Afaha, J. (2013). Impact of Cashless Economy in Nigeria. Greener Journal of Internet, Information and Communication Systems.2 (3), 40-43. https:/10.15580/GJIICS.2013.2.020713436.
13) Nonor, D. (2011). Ghana Airtel Leads Drive towards Cashless Economy, Retrieved From https://www.1q4news.com
14) Omotoso, K. & Adelowo, C.M. (2014).Prospects of Nigeria's ICT Infrastructure for E-Commerce and Cashless Economy. https://www.researchgate.net/publication/268808036_Prospects_of_Nigeria's_ICT_Infrastructure_for_E-Commerce_and_Cashless_Economy
15) Omotunde, M., Sunday, T. & John-Dewole, A.T. (2013). Impact of Cashless Economy in Nigeria. Greener Journal of Internet, Information and Communication Systems, 1 (2), 040-043.
16) Oppenheimer, P. (2006). Top-Down Network Design Second Edition, Cisco Press
17) Ortiz, C. E. (2008). An introduction to near field communication and the contactless communication API: https://www.oracle.com/technetwork/articles/javame/nfc-
18) Prateek, A. (2019). Economic Growth and Development. Retrieved on August 13, 2019 from https://www.intelligenteconomist.om
19) Salihus, A., Mustapha, K., Ajayi, I. H. & Binitie, A. P. (2013). The Impacts of Information Technology in a Cashless Economy in Nigeria. The International Journal of Engineering and Science (IJES), 2(10), 80-86.
20) Spacey (2018). What is network infrastructure. https://www.google.com/amp/s/simplicable.com/amp/network-infrastructure