

Electronic Money, Digital Cloud Payments, Banknote Redesign Policies and Currency in Circulation: Relevance of Cashless System and Technology Acceptance Theory in Nigeria

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JEL Codes: E4, E51, E69, E60, E65

DOI: 10.56201/ijbfr.v9.no2.2023.pg34.54

Abstract

The electronic money, digital cloud payments, banknote redesign policies and currency in circulation vis-à-vis relevance of cashless system and technology acceptance theory in Nigeria is a rarely covered topic. Design policies are used by central banks to give direction to the design process of banknotes. The study of the banknote design policies of the past century shows that ‘technology-centred policies’ are gaining popularity. Even cryptocurrencies such as Bitcoin, Ethereum, Facebook’s Diem, Corda, Fabric and Ripple are competing for a spot in the cashless world, constantly reinventing themselves in the hope of offering more stable value, and quicker, cheaper settlement (Chapman, 2021; (Shao et al., 2021; Zhang & Huang, 2021). The sole aim of introducing digital currency is to reduce the volume of physical currency in circulation which in turn destabilizes socioeconomic development of a country (Barontini & Holden, 2019). It is well-known fact that many people and businesses don’t accept innovations especially the ones caused by technology. Finally, from the literatures reviewed, the redesigning of the Naira is for economic reasons which is not limited to reducing inflation, combating counterfeiting, checking financial insecurity and reducing the money in circulation. There has been a wide acceptance of electronic banking in Nigerian banks and technology has become more popular as service offering to customers have become more convenient, thereby, leading to an increase in competitiveness and profitability. There is a swift variation in the method of conducting business globally and in Nigeria, particularly which is borne from advancement in e-banking. Awolusi and Aduaka (2020) has said that it is becoming progressively difficult to satisfy customer expectations. The cashless economy does not imply an outright end to the circulation of cash (or money) in the economy but that of the operation of a banking system that keeps cash transactions to the barest minimum.

Keywords: *Digital cloud payment platform, electronic money, banknote redesign policy, physical currency in circulation and cashless system, technology acceptance theory (TAT)*

1.0 Introduction

From the aspect of the development of e-payment method, digital currency is not physically printed by the Central Bank. For now, digital currency is considered with its own rules of the game. In the literature, all those who support the use of Bitcoin underscore the characteristic as a currency that does not cause financial crises. Namely, the view is that banks can print more money to cover their national debt, thus devaluing their currencies, Bitcoin does not function in such a way.

Technological innovations are changing the payment system day by day, and interest in cash-like assets increases. With the adaptation of cryptocurrencies to payment systems, competition with traditional payment instruments has begun. These developments present opportunities and threats against monetary policy. Central banks, which have an essential role in payment systems, tend to take an active role in these issues. The use of cash decreases, and the private sector erodes the impact of monetary policy by issuing stable cryptocurrencies. CBDC can be a policy tool that can expand the sphere of influence of monetary policy. While increasing dollarization and crypto monetization limit the effectiveness of the monetary policy, the use of CBDC as an alternative payment method may increase the effectiveness of the monetary policy (Bech & Garratt, 2017; Berentsen & Schär, 2018). The co-existence of central bank money and cryptocurrencies will push all banks to behave more disciplined.

With the CBDC, other economic actors other than the banking sector will have the opportunity to open accounts within central banks, make payments with digital currencies and transfer money to other central banks, as well as (Al & Akyazi, 2019) exchange between digital currencies. Thus, the digital money they hold will be centralized and decentralized. Suppose central banks do not issue digital money. In that case, the depreciation of local currencies, especially in developing countries, will lead people to digital currencies (gold, oil, silver, etc.) whose value is fixed to a particular asset.

The Central Bank of Nigeria (CBN) has in recent times 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 ₦500,000 for Individuals and ₦3,000,000 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 (Isah & Babalola, 2019). credit cards or bank transfer. In Nigeria, under the cashless economy concept, the goal is to discourage cash transactions as much as possible. The CBN had set daily cumulative withdrawal and deposit limits.

Alternatively some central banks proposes different policies depending on the country such policies include: digital currency, virtual currency (Naheem, 2016). Key functions of money today; to carry the purchasing power to the future as a means of value storage, to be a tool of exchange for the payment of goods and services, and to be a unit of value. It seems difficult to use these concepts, which can be used for hard money, for the fiat currencies used by the citizens of developing countries. The flight from fiat currencies, which constantly depreciates in

the face of inflation, is increasing day by day. In the absence of hard money, gold, and gold standard, there is no way to protect savings against inflation (Greenspan, 1966). With the development of technology, the use of cash has decreased and paved the way for innovations to emerge. One of the innovations introduced in the field of payment systems is cryptocurrencies.

Electronic money and derivatives have started to attract the attention of central banks. Central banks need to closely follow these innovations in terms of price and financial stability. It is thought that the widely accepted private cryptocurrencies will reduce the effectiveness of the monetary policy and weaken the central bank's ability to be the lender of last resort (Fung & Halaburda, 2016). Cryptocurrencies can be defined as digital currencies that are based on mathematical algorithms, do not lose their value due to inflation, and are not dependent on central institutions such as the central bank. The best-known cryptocurrency is Bitcoin which was discovered by an unknown person or persons nicknamed Satoshi Nakamoto in 2009. Bitcoin is also called the gold standard of cryptocurrencies thanks to its decentralized structure, the absence of any institution or state behind it, its limited number, its divisibility, and its mining (Leblanc, 2016; Akdag & Bozma, 2021).

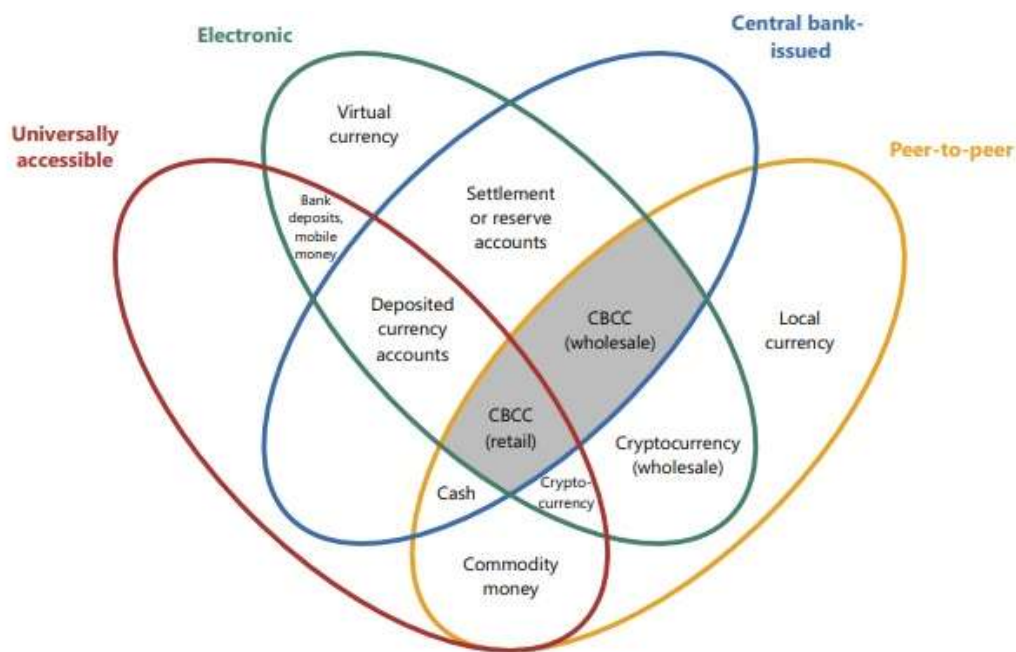


Fig. 1: Electronic Money Flower
 Source: Bech & Garratt (2017).

An e-money transaction does not require an intermediary at present because the money expressed in units (called bits) is electronically transferred from the buyer to the seller. The amount of money that has been paid is prepared at the seller's terminal, i.e. his account is transferred to the financial institution from time to time. Payment with e-money reduces transaction costs, and time is shortened compared to other forms of payment. Humphrey and

colleagues estimate that the cost of using electronic money amounts to one third to half of the cost of paying paper money. When all transactions in one country would be carried out electronically, it would be possible to save more than 1% per year BDP.

There are two reasons for the emergence of electronic money and digital currencies. The first, according to the Austrian School of Economic Analysis money is a “social institution” subject to the already initiated institutional change and is interpreted as a consequence of a spontaneous evolution that should overcome the shortcomings of the swap and the double coincidence of desires. Today e-money is the last stage of this development and represents an additional degree of institutional change.

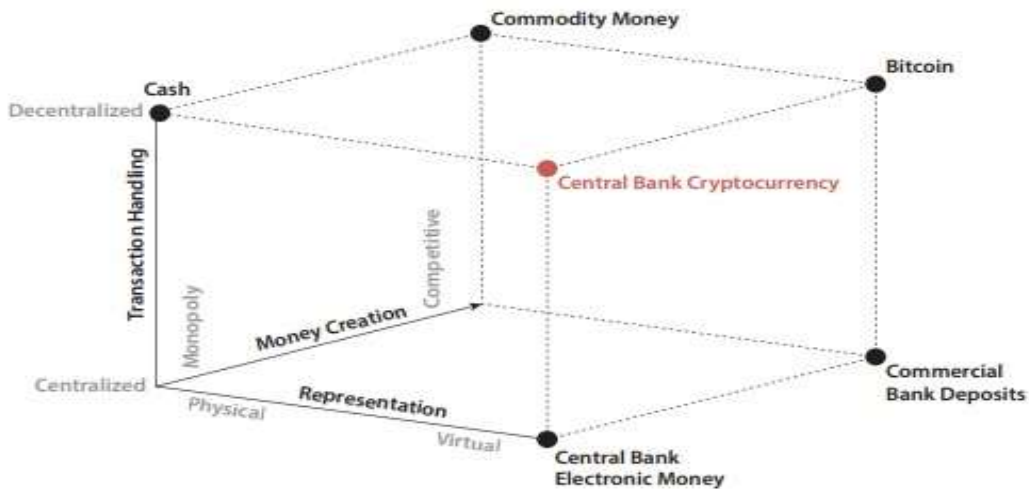


Figure 2. Control Structure of Currencies

Source: Berentsen and Schar (2018)

1.1 Potential of cryptocurrency

There are different and confronted opinions regarding the future of cryptocurrencies in general. The optimistic view of the use of cryptocurrencies is supported by the fact that they easily transfer funds between two parties in the transaction. These transactions are facilitated by the use of public and private keys for security purposes (Bech & Garratt, 2017; Berentsen & Schär, 2018). These fund transfers are made with minimal processing costs, allowing users to avoid large fees charged by most banks. In addition, many countries have begun to accept Bitcoin as a valid currency. In particular, countries that aim to get rid of cash have a very friendly approach to encryption. The argument that the promoters use for Bitcoin is the market capitalization of Bitcoin, ether and other cryptocurrencies, claiming that the cryptocurrency market has become very large and powerful, and the ban would be expensive for each country. Today, the total value of all cryptocurrencies has reached a record of value of more than \$ 390 billion. Among other significant cryptocurrencies are Ripple and Ethereum. The cryptocurrency Ripple, designed for banks and global money transfers, has seen a major feat in the value of its digital currency that has risen in recent months.

Their main role is to support online e-commerce, enable transactions, reduce their costs, or replace the payment of money and coins in retail. The second reason for the emergence of e-

money is the information revolution, which is characterized by the integration of electronic information processing and telecommunication technologies, which reduces the geographical differences by means of which information can be transmitted to the whole world. The information revolution has changed the financial sector, making payment modes more secure and more efficient, giving an additional reason for the emergence of new monetary innovations.

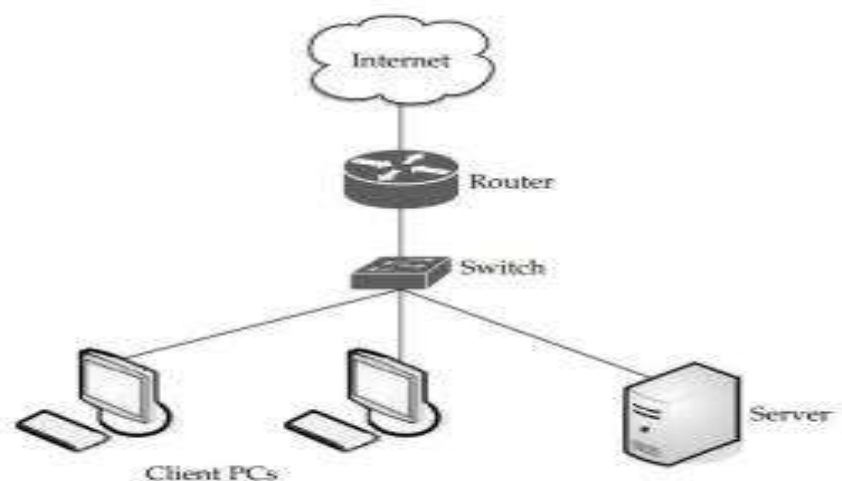


Fig3: Digital Cloud Payments is depicted by a cloud in a network or internet

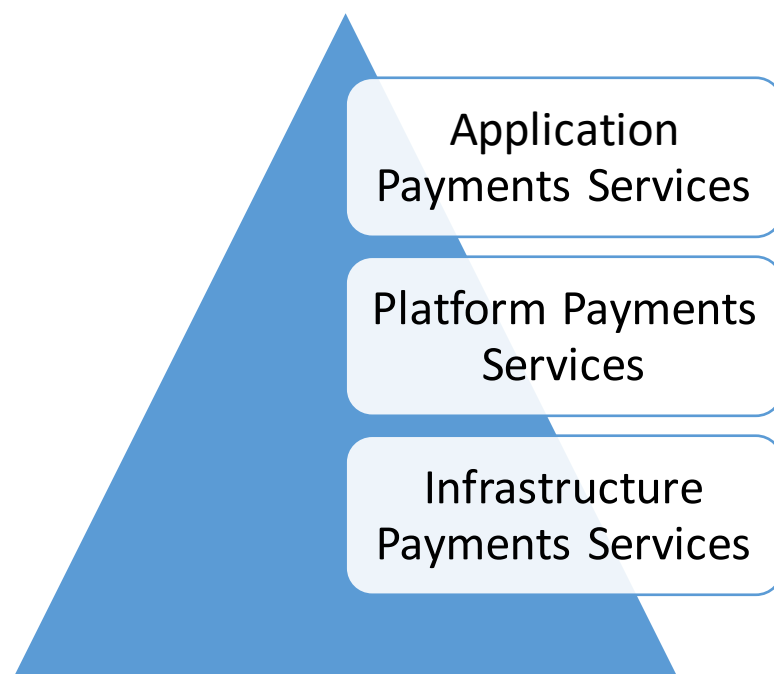


Fig. 4: Digital Cloud Payments Architecture

Source; Authors' 202

1.11 Software as a Service (SaaS): In this model, a complete application is offered to the customer, as a service on demand. A single instance of the service runs on the cloud & multiple end users are serviced. In this model, cloud service providers are responsible for running and maintaining application software, operating system and other resources. SaaS model appears to the customer as a web-based application interface where internet is used to deliver services that are accessed using a web-browser. Benefits of SaaS Solutions: Rapid Scalability; Accessibility from any location with Internet; Eliminates infrastructure concerns; Custom levels of service offerings and Bundled maintenance and Support.

1.12 Platform as a Service (Paas): Here, a layer of software, or development environment is encapsulated & offered as a service, upon which other higher levels of service can be built.

1.13 Infrastructure as a Service (IaaS):

IaaS provides basic storage and cloud provider. Servers, storage systems, networking equipment, data centre space etc. are pooled and made available to handle workloads. The customer would typically deploy his own software on the control, which is typically lacking in a infrastructure. In (IaaS) the cloud service provider provides a set of virtualized computing resources like CPU, Memory, OS, virtualization technology to convert physical resources into logical resources that can be dynamically provisioned and released by customers as needed.

Benefits of IaaS Solutions: Reduces cost of capital expenditures; Users pay for the service they want; Access to enterprise-grade IT resources and infrastructure and Users can scale up and scale down the resources based on their requirements at any time.

1.14 Regulatory and Compliance Restrictions

In some of the European countries, Government regulations do not allow customer's personal information and other sensitive information to be physically located outside the state or country. In order to meet such requirements, cloud providers need to setup a data center or a storage site exclusively within the country to comply with regulations. Having such an infrastructure may not always be feasible and is a big challenge for cloud providers.

With cloud computing, the action moves to the interface –that is, to the interface between service suppliers and multiple groups of service consumers. Cloud services will demand expertise in distributed services, procurement, risk assessment and service negotiation – areas that many enterprises are only modestly equipped to handle.

1.15 Physical network infrastructure

It guarantees that data among servers and users travel with suitable and acceptable speed. Although the data links become so fast, many companies lend slower link for reducing the cost for themselves and the best offer for clients. When packets move from source to destination, the speed of data transfer should not affect applications and services.

2.0 Conceptual Review

2.1 Electronic Money

Electronic banking has also been defined as the medium of using electronic devices, like internet, wireless connections, networks, ATM, phone and cell phones in banking services. To give banking service to clients, various electronic banking delivery media are used by the banks. Among them, banks widely use ATM, internet banking, mobile banking and POS and these are discussed as follows: Automated Teller Machine (ATM) is a machine where without going in to the banking hall cash withdrawal can be occurred by using the machine. Funds are transferred and recharge cards are sold by it; Clients can access it 24 hours/7 days with account balance investigation. Internet Banking: To conduct financial transactions on a secure website conducted by the institution, Internet banking allows clients of a financial institution, which can be a virtual or retail bank, society or credit union. Various transactions may be comprised by it related to online usage.

Point of sale (POS) also often referred to as checkout or point of purchase (POP) is the position where a transaction occurs. The hardware and software is referred as A 'checkout' used for checkouts or more generally to a POS terminal, the same of an electronic cash register. Mobile banking, is used for managing credit applications, balance checks, payments, account transactions, and other banking transactions through a mobile device such as a Personal Digital Assistant (PDA) or mobile phone.

2.2 Banknote Redesign Policies

The design policy of banknotes is a rarely covered topic. Design policies are used by central banks to give direction to the design process of banknotes. As such policies are often incomplete, designs for new banknotes may completely surprise the policymakers. A study of the design policies of the past century shows that 'use-centred policies' are gaining popularity. However, a real use-centred policy, which is based on all the functions a banknote will have to perform, is yet to be applied. It is important to distinguish between design policies and 'stakeholder policies'. Stakeholders are all parties involved in the supply chain of banknotes, such as manufacturers and distributors. They provide the infrastructure that makes paying with banknotes possible. If people cannot use the new banknotes to make payments, they will become irritated, so the infrastructure should be ready in time (De Hei, 2010; De Hei, 2009).

In Nigeria, Central Bank of Nigeria(CBN) announced that the bank would release re-designed naira notes by December 15, 2022, while existing notes would cease to be regarded as legal tender by January 31, 2023. Through this policy, the apex bank aims to control the money supply, and inflation, as well as, curb counterfeit currency. Also, the apex bank noted that available data indicated that ₦2.73 trillion out of the ₦3.23 trillion currencies in circulation was outside the banking system and supposedly, held by members of the public. Despite the various monetary policy measures and reasons for the re-design of the naira by the CBN, there were both positive and negative effects of the re-design. From a positive view, the re-design would enable the apex bank effectively control the liquidity in circulation, thus reducing inflationary pressure in the economy. From the monetary policy perspective, global best practice demands that countries restructure their currencies every five to eight years. Thus, the re-design of the Naira by the apex bank is justifiable; it's a crucial step towards ameliorating the large volumes of money in circulation outside the banking system, but the problem is more than just the redesign

of the low confidence levels of Nigerians in the Naira. In December 6, 2022, the Banking Supervision Department of CBN brought out a new policy that will work in line with the new naira redesign and cashless policy that will be taking effect from January 9, 2023, with the following details: Maximum cash withdrawal by individuals and organizations shall be between ₦100,000 to ₦200,000 per week; A customer can only withdraw a maximum of ₦20,000 from Automated Teller Machine (ATM) daily and ₦100,000 weekly and Maximum cash withdrawal from POS will be ₦20,000 per day.

Three vital things to note from this CBN policies are: Retrieve all idle currency from the economy by currency redesign; Promote cashlessness, traceability and accountability by setting cash withdrawal limits and charges. The idea is to keep the currency within the banking system as possible and reduce recurring expenditure of printing naira. CBN spend about ₦58 billion to print approximately ₦2.5 billion worth of currency. This policy has both positive and negative implications for the economy of Nigeria. On the positive angle, this policy aims at promoting a cashless policy, improving the electronic use of the payment, When the currency redesign programme was launched in October 2022, the hoarding of banknotes, especially among the country's elite corps, was at its peak. A data released by the CBN indicates that at the time when the programme was launched, over 85 per cent of the money in circulation was outside the vaults of commercial banks and supposedly held by the public. In the words of the CBN Governors, "at the end of September 2022, available data at the CBN indicates that ₦2.73 trillion out of the ₦3.23 trillion naira currency in circulation was outside the vaults of commercial banks across the country" (CBN, 2022). Only ₦500 billion was within the banking system. This challenge, coupled with the rapid increase in the amount of currency in circulation- which morphed up from ₦1.46 trillion in December 2015 to ₦3.23 trillion as at September 2022- mandated the management of the apex bank to embark on currency redesign as a means of ensuring effective currency management. From the beginning of the programme in October 2022 to 29th January, 2023 (eleven days to the February 10th deadline, set for the demonetization of the old notes) the CBN had recollected 75 percent (₦1.9 trillion) of the ₦2.73 trillion of the old notes that were outside the banking system when the programme was launched (CBN, 2023; Abubakar & Yandaki, 2023)

In pursuance of the cashless policy, the Apex Bank released only ₦400 million of the new notes to replace the ₦1.9 trillion of the old notes it recollected. It also pegged weekly limits on the amount of new notes that could be withdrawn by individuals and organisations (CBN, 2022). Initially, the CBN directed that over-the-counter cash withdrawals by individuals and organisations be limited to ₦100,000 and ₦500,000 respectively. On the directives of the National Assembly, however, the limit was reviewed upward to ₦500,000 for individuals and ₦5million for organisations (Adegboyega, 2022). This attempt by the CBN to force the Nigeria's jump into a cashless economy threw the country into an unprecedented cash crunch, which exposed the weaknesses of Nigeria's e-banking channels: commercial banks had limited cash to dispense through ATMs and mobile banking applications became impotent due to high traffic of electronic transactions necessitated by the cash crunch. At the height of the cash crunch, which spanned throughout February and March 2023, one author described the critical situation created by the scarcity of cash in an article titled "Nigeria's Season of Cash Scarcity".

2.3 Technology-Driven Banknotes Redesign and Use-Centred Banknotes Redesign

The two main user groups, the general public and the retailers, are not represented in the banknote's design process. Common banknote design policies are either dominated by a 'printer's view' or by a 'cashier's view,' depending on who is in charge at the central bank. A typical cashier's view is a 'father knows best attitude', when the central bank's management decides on a design on behalf of the population. However, both views represent a 'technology-driven' design policy, which tends to focus on authenticity features and durability properties.

The Central Banks, however, recognises the need for a 'user's view:' "The transformation from centrally designed by in-house designer to public participation for indigenous designing of banknotes can be effected gradually but steadily." A use-centred design policy for banknotes will balance user behaviour and technology. Portability, automatic processing; Similar sizes, paper tint and watermark; New security feature; replacement of large number of counterfeit; celebration of national statemen or nation; cost reduction notes (polymer notes); Low production costs; Durability; Authenticity features; Sorting system central bank; Value recognition, value determination and Denomination features

Emergency banknotes are prepared to be issued if the number of counterfeited banknotes is beyond control. The concept of auxiliary, substitute or fallback banknotes is similar to that of emergency banknotes. He revised policy stipulated that a new banknote should be developed within two years, including new authenticity features. Instead of new banknotes in their vaults. The fact that 'authenticity' policies have always been popular, is not surprising as banknotes have endured three major technical threats of being counterfeited in large numbers. Central banks may say that it is their policy to stay one step ahead of counterfeiters, or they may say: "It's about getting the balance right between something that's difficult to counterfeit but very simple to authenticate". Central banks may also try to reduce costs with a 'low production costs policy'.

Another reason for a new series may be changes in the central bank's banknote sorting systems. Policies that facilitate this usually concern the introduction of a 'new feature plus detector' Value recognition' is a design policy aiming for unambiguous identification of the note's value. Banknote designs are often suboptimal when it comes to value recognition. The design policies discussed so far represent two basic models to approach new banknote design: 'refreshing existing models' and 'emphasising the use of a banknote.'

User-centred design, as opposed to use-centred design, was introduced by Don Norman. A user-centred design policy is characterised by an early and continual focus on people using the product. three basic principles of 'designing for usability:' an early focus on users and tasks, empirical measurement and an iterative design. In the case of a banknote it is more appropriate to focus on the use of banknotes rather than the user, as a banknote is not a consumer product, but a collectively used product.

Banknote design policies have evolved and are becoming more technology-driven and less use-centred. A use-centred policy aims for user-friendly banknotes, covering all user experience functions and all user interface functions. The key to such a policy is the involvement of the general public and retailers; their feedback should be used in several steps of the design process. In this view, it is the central bank's task to represent the user and formulate user requirements and subsequently design requirements.

3.0 Theoretical Framework

3.1 Technology Acceptance Theory (TAT)

TAT was first proposed by Davis et al. (1989) to examine the conceptual model of the intention of user or the degree to which information system or new technology has been done. TAT is designed on the basis of perceived usefulness and ease of use of the new technology. Perceived usefulness of technology suggests the personal conviction to better the degree of work performed by a specific new technology or information system. Perceived ease of use of new technology implies how easy a person can learn the way to use or run a new technology or information system.

The TAT model has stressed on the way perceived ease of use of new technology directly influences perceived usefulness of the technology. External variables such as environment factors surrounding an individual intervene in influencing perceived ease of use and usefulness. Hence, Technology Acceptance Theory has a basis in both crucial perceptive factors that is perceived usefulness and perceived ease of use. Technology Acceptance Theory is applied vastly on the researches involving IT. Liu et al. (2010) analyzed the important variables to come up with a successful website which has its basis on TAT theory. Technology Acceptance theory is a key theory that underpins the current study on exploring the role of e-money, digital cloud payment platform and banknote redesign policy on currency in circulation: relevance of the cashless system.

3.2 Unified Theory of Acceptance and Use of Technology (UTAUT)

UTAUT was first proposed and theorised by Davis, F. D. Several researchers including Davis (1989) reviewed 8 models regarding the usage of ICT, they are; “the social cognitive theory a model, TAM and TPB, Diffusion of Innovations (DOI), Technology Acceptance Model (TAM), the model of PC utilization, DOI, the motivational model, Theory of Reasoned Actions (TRA) and Theory of Planned Behaviour (TPB).” UTAUT was created mainly to help researchers in the field of IT/IS in the process of adoption and diffusion. In the theory, it is argued that there are 4 major: “Effort expectancy, performance expectancy, facilitating conditions and social influence.” The four constructs have positive effect on IS/IT behavior intents and ultimately behaviour (Davis, 1989). UTAUT also provides a foundation for the current study. It discusses in details on how innovative technologies in banking sector is adopted and used by the employees of the bank as well as the clients of the bank. The model sought to discuss the intension of the user to adopt ICT and the succeeding behaviour of user. UTAUT offers the managers with decision-making tools that they can adopt to comprehend the introduction of new technology for prediction and elaboration of the behaviour of users in accepting IT.

3.3 Social Construction of Technology Theory

Social Construction of Technology Theory: This theory otherwise known as SCOT in the Science and Technology field holds that there should be a critical look at the social world for those that look for the comprehension of the bases of a technology recognition or rejection (Matira & Awolusi, 2020). Hence, technical supremacy or superiority is not the only basis for a technology acceptance but also the social factors. Under this theory, the foremost proponents contend that technology is not the determinant of the actions of humans, but rather, that the actions exhibited and displayed by humans are actually what

put technology in shape. They also contend that without comprehending how technology is entrenched in its social perspective, the usage of technology can also not be understood. In general, SCOT is a theory about how a diversity of social factors and forces adjust technological advancement, technological transformation, and the connotations related to technology. As a methodology is validated the required steps in the event of analyzing what is responsible for the success or failure of technology. This theory is used in this study to explain in what manner e-banking is adopted.

3.4 Theory of Reasonable Action (TRA)

The Theory of Reasonable Action (TRA):It postulates that the behavior of humans is expected by the intent of an individual to involve in a particular behavior. The intent, on the other hand, is subject to two factors, which are the attitude of the individual as a consequence of the behavior and the views of the individual's social environment, referred to as the subjective norm (Fishbein & Ajzen, 1975). TRA hypothesizes that when there is a positive assessment by a person or an individual to execute a behavior, the intent to perform that behavior becomes higher (Ajzen, 1991). There has been a successful application of TRA in internet banking services environment to forecast behavioral performance and intent. As an example, it has been used in Taiwan to evaluate the effect of the attitude of customers and subjective norm on internet banking adoption (Shih & Fang, 2004). The outcome showed that attitude has a substantial effect on adoption intent, whereas subjective norm did not. The intent of the user to make use of, agree or adopt one or more of the IT areas is what behavioral intent determines according to TRA. It is used to explain the adoption of electronic banking by banks in this study.

3.5 Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM) is by Davis, Bagozzi, and Warshaw (1989) to show technologies as well as information systems recognition and acceptance by the users. The theory stated that users' decision is affected by several factors regarding when and how new technology can be used when presented (Davis, 1989). Its application has been to various innovative technologies like internet banking, mobile commerce and the implementation of mobile internet since it was developed (Hong et al., 2006). It has also found its application in various educational perspectives like online education (Ngai et al., 2007) as well as mobile learning (Liu et al., 2010). TAM is useful in the description of electronic banking adoption by banks, as well as to forecast, comprehend and to offer an explanation as to the reason to accept or reject information systems by people.

4.0 Cashless System

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 are 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. It is defined as "one in which there are assumed to be no transactions frictions that can be reduced through the use of money balances, and that accordingly provide a reason for holding such balances even when they earn rate of return. Isah and Babalola (2019) observes that in a cashless

economy, how much cash in your wallet is practically irrelevant. You can pay for your purchases by any one of a plethora of

The e-Naira is a Central Bank Digital Currency (CBDC), which is the digital equivalent of the cash Naira. Just like the physical cash, the e-Naira is an official legal tender of Nigeria and is part of the currency in circulation. But unlike the physical cash whose transactions could be carried out through bank accounts and e-banking systems that are direct liabilities of financial institutions, the e-Naira transactions are done through the e-Naira Wallets, which are direct liability of the CBN (CBN, 2021). The major reasons behind the introduction of the virtual currency, likened to crypto-currencies, include the need to improve availability and usability of the Nigerian currency, support a resilient payment ecosystem, encourage financial inclusion, reduce the cost of cash production, enable direct welfare disbursement to citizens, increase revenue and tax collection, facilitate Diaspora remittances, and reduce the cost and improve the efficiency of cross-border payments (CBN, 2021).

The launching of the e-Naira was part of Nigeria's drive towards creating a digital and cashless economy. This drive, which aims towards reducing the amount of physical cash in circulation and encouraging more digital and electronic-based transactions, was ignited with the official take-off of the cashless policy of the CBN on April 1st, 2021. The basic objectives of this policy was to, among other things, reduce the cost of banking services, checkmate the high level of corruption in the country and improve the effectiveness of monetary policy in managing inflation and driving economic growth. At its take-off, Lagos was chosen as the testing ground for the policy. The policy was, however, expanded to cover the Federal Capital Territory (FCT) Abuja and the five states of Kano, Rivers, Abia, Ogun and Anambra before it finally extended to other states of the federation (Ovat, 2012; Abubakar & Yandaki, 2023)

It should be said that as at now there are already some forms of cashless transactions that are taking place in Nigeria. It is noted that: Today there are up to seven different electronic payment channels in Nigeria, Automated Teller Machines (ATM), points of sales terminals, mobile voice, web, inter-bank branch and kiosks. E-payment initiatives in Nigeria have been undertaken by indigenous firms and have been stimulated by improvement in technology and infrastructure.

It is well known scenarios that people buy and sell goods and render services and made payments using their phones or computer related devices (e-commerce or e-business). Apart from credit and debit cards there are some payment system applications such as Google Pay, Apple Pay, PayPal, or one of the growing number of other payment system apps on the market. Nowadays, mobile phones provide users with numerous opportunity to make payment via e-wallets and e-money solutions (Isah & Babalola, 2019). Moreover, younger people seem to prefer to pay for goods and services using mobile payment solutions rather than credit or debit cards (Bilotta, 2021).

This study synthesizes and analyzes the association between CBDC and Physical Currency in the light of features, perceived benefits and challenges. Shen & Hou (2021) once explained that the reserves and deposits are digitally the same with digital currency. For instance, reserves refer to the deposits of commercial banks and other financial institutions stored in the central banks so as to protect both the customers and the financial institutions from being insolvency. As

a general obligations or rules all financial institutions have to keep certain percentage of the deposits collected from various depositors as a reserves into central bank as a guarantee (banks' financial backup). However, the deposits, and reserves are not different from CBDC as the two were also enable inter-bank settlement in terms of digitization. Deposits and reserves perform the same function as digitally stored on the account balance of financial institutions (Fernández & Olga, 2019). Both CBDC, deposits and reserves are digitized without any physical forms and all can be accessible through the use of computer-related devices.

Whereas the use of physical currency requires a direct physical contact between two or more parties in order to exchange value, however, CBDC dodges the need for any financial institution such as a bank to intermediate the transaction, although several digital intermediary services (by digital device and internet) may be used in order to facilitate the transaction (Naheem, 2016). There are a lot of benefits that can be derived from using CBDC. Firstly, it explained that for customers; CBDC reduces transaction costs directly. Secondly, it allows reduction in the policy rate which is only applicable on the depositors and in turn it bust income levels increase the profits of the bank and reduces the expected cost of capital related fine. Finally, for government it reduces the stock of debts in the hands of the public and therefore reduces the government lending rates which reduces the needs for distortionary taxation (Chapman, 2021).

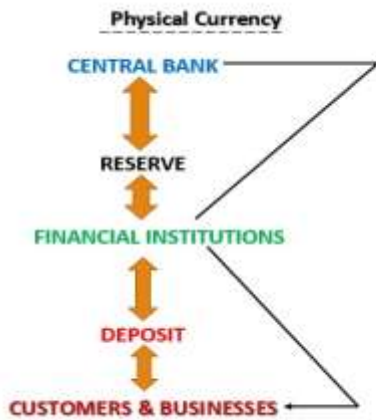


Figure 2: Transaction of Physical
 Source: AHMED et al. (2022)

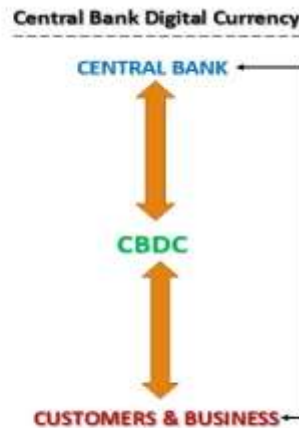


Figure 3: Transaction of CBDC Currency

4.1 Payment Processing Through CBDC Currency

Central Bank Digital Currency as a definition; It is electronic money that is put into circulation by the central bank, can be used for payments, can be accessed by anyone 24/7, is tied to the national currency, has a nominal currency obligation, and can be used as a store of value (Kumhof & Noone, 2021); Meaning et al., 2018).

Controversy continues where the Central Bank Digital Currency lies between banknotes and electronic money used in the interbank market. In the first studies on this subject, an approach called Money Flower was revealed by the Bank for International Settlements (BIS) (Figure 2). In the new approach adapted to digital technologies, money is examined in four

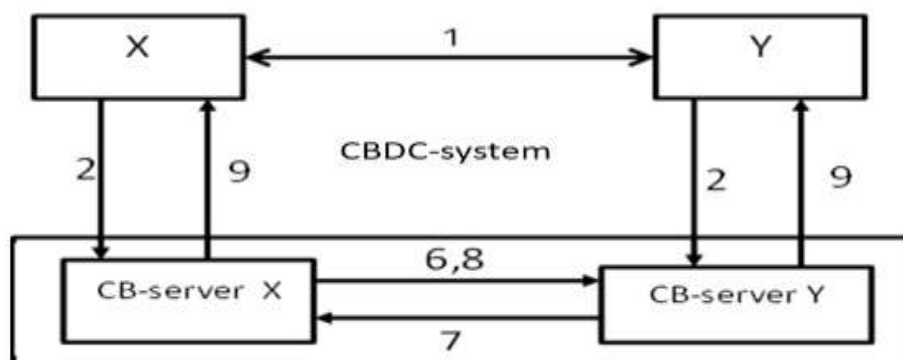
sections; widely accessible money, digital money, money issued by the central bank, and token-based money (Bech & Garratt, 2017).

The transfer of money from one account to another. Each actor has one or more accounts in the CBDC-system. And because it is a very large system, for a whole payment zone, we assume that the public database of this system is distributed, which means that it is a network of connected database servers. It is called a dedicated computing cloud. Each account is assigned to a specific database of the network called CB-server. Each of these servers stores many account objects. Remember that from each account only the fingerprint of the current balance and maybe the fingerprints of transactions are stored here. Further all actors store their current balance record on a private server. This can be a PC at home, a smartphone or a server in the cloud from some service provider. It is possible and advisable to store the balance record in more than one place. It is called a private server an e-wallet, which term is usually restricted to storage on a smartphone. The data is stored in databases.

According to Wijngaard & Van-Hee (2021), the kernel protocol has the following steps:

1. X and Y agree on a money transfer of amount B from X to Y. They produce both the same (common) transaction record. This first step is performed outside of the CBDC-system.
2. X and Y both send each their account record and the common transaction record in a secure message, signed with their digital signature, to the CBDC-system, in fact to their own CB-server.
3. The CB-servers check the authenticity of the messages by the digital signatures.
4. They check the account records (by checking the fingerprints).
5. If the balance of X is insufficient for the transaction, then the CB-server of X sends a return message with a disproof and also a similar message to the database of the acquirer, who returns a similar message to the acquirer.
6. If the balance of X is sufficient, his CB-server sends the transaction record to the CB-server of Y.
7. The CB-server of Y compares the (common) transaction records of both actors and if identical, which proves that they both agree upon the transaction, he updates the balance of the account of Y by adding B and confirming it to the CB-server of X.
8. Then the CB-server of X updates his account by subtracting B from the balance, and informs the CB-server of Y.
9. Then both CB-servers send to their actors a secure message with digital signature and the updated e-wallet record with a fresh nonce.
10. Both CB-servers delete the transaction information after updating their CB-record with the fingerprint as described above.

The protocol looks very similar to the way the banks operate today. The essential differences are: (1) the use of CBDC (i.e. base money) instead of demand deposits (claims on base money), (2) a clear split in the currency: the money of an actor is his account balance and that balance is stored by the actor in his e-wallet and not at the CB and (3) commercial banks don't play a role in this process. The CBDC-system does not store the balance but is able to verify the content of the e-wallet. So the CBDC-system can't do anything with the money of the actors. Note that the communication within the CB-server can be secured in the same way as between these databases and the e-wallets. But since it is one system it can be done with fewer security measures.



Source: Wijngaard & Van Hee (2021).

4.2 Challenges of CBDC and Physical Currency

Unlike physical currency, there are some cross border challenges in CBDC such as policy, implementation, scalability, cross-chain interoperability (Zhang & Huang, 2021), acceptability, convertibility (Fernández & Olga, 2019; Yanchao, 2021). Cryptocurrencies as enabler of CBDC offer an opportunity for dramatic cost reductions, which may translate into faster and less expensive transactions, for instance in remittances. But it is unclear whether CBDCs may compete with cryptocurrencies in this, being based on national payment systems. Central Banks may, however, have incentives to develop interconnected payments systems for cross-border transactions if threatened by the competition of cryptocurrencies (Fernández & Olga, 2019). With regards to monetary policy issues associated with digital currencies, no digital currency seem likely to come into sufficiently widespread use to complicate the control bank's ability to moderate the business cycle and control inflation (Nelson, 2018).

The differences between the CBDC and physical currency is one of the biggest concern that this study intent to address. Inadequate public awareness about the different functions of CBDC over physical currency counterpart lead to its slow implementation in most of the developing countries. (Williamson, 2021) still claimed that CBDC is good payment system, despite the fact that even when central bank replaces physical currency with CBDC will automatically reduce the functions and roles of other financial institutions in the eyes of the customers. There are some of cash related challenges faced by different central banks around the globe. Some central banks reported a high reliance on cash and are motivated by reducing costs and improving know-your-customer and countering-the-financing-of-terrorism arrangements. While some central banks have the opposite challenge such as low or declining use of cash for payments motivates research into a CBDC that would maintain public access to central bank money. Boar et al. (2020). At this early stage, when CBDCs are still in the laboratory, central banks may want to at least keep an eye on the inclusion of an adjustable CBDC interest rate, weighing its benefits against possible political economy costs (Agur et al., 2021).

The CBDC-system has the following advantages: There is only digital currency created by the commercial banks; Money is stored by the actors themselves; Money transfer is very easy: only the essential functions are performed by the CBDC-system in a very efficient and secure way; The system is an ideal platform for additional financial services; The system has good features to avoid money laundry and tax evasion and The system has good features for rule-based monetary policies

Many people are afraid of a centralized system where a Big Brother could control everything. For that reason crypto currencies were invented, the first one by David Chaum (Chaum 1983) in 1983 and later the Bitcoin by Nakamoto (Nakamoto 2008) in 2008. From the latter system there are many new variants available. In our CBDC-system the information stored is extremely limited. The system is only facilitating transactions and does not store these data and so the system does not know the balances of the actors. So the Big Brother problem is solved in this CBDC-system.

A big problem of crypto currency is the double spending problem: how to avoid that the same money is spent twice or more times. That is why systems like the bitcoin system have introduced the so-called block chain which is extremely time and energy consuming. In our system double spending is solved by the CBDC-system in a trivial way. So that is also an advantage.

4.3 Features of the Commercial Banks Digital Currency-system (CBDC-system)

In principle it is possible to construct a digital look-a-like of a physical currency, i.e. a coin or bank note. However, that is unnecessarily complicated. This is also noted in Bordo and Levin (2017), but here it will be explained in more detail. If we pay with cash we always have to look for the right coins and then we often receive change in return because we did not have the exact change. It is much easier to have only a *e*-wallet with one amount, the balance of an account and then one can pay any amount less or equal to the balance. So it is more efficient to store one amount: the balance of the account. This is the same as in the well-known banking system that we are using today, and that feature is worth to keep in a CBDC-system. Even in the bitcoin system there are also no “digital coins” or “digital bank notes”, although the term “bitcoin” suggests this. However there the transactions are stored, which means that if actor X pays an amount A to actor Y then Y records this transaction and he may spend this A, i.e. transfer it to some other actor, at a later stage. So in order to pay a large sum the payer has to find enough transactions to do the payment and if there is not an exact match, he has to transfer the change to himself as a new transaction. This is even more laborious than a cash equivalent. Coins and bank notes have complex marks on it and bank notes have a unique identifier, a string of characters. One of the main characteristics of physical currency is that it can be transferred between two actors in isolation, i.e. without any contact with a third party. Of course a forger can try to ‘copy’ a physical currency. In order to verify a coin or bank note one inspects the marks on the coin or bank note. It is practically impossible to verify if the currency is unique, i.e. if its identifier does not occur twice or more times in the monetary system. Suppose a digital equivalent of a physical currency unit is just a single sequences of bits. Then we could encode this bitstring such that it can be verified that it satisfies all the official characteristics of the currency. But it is always very easy to copy it! And then we have a new currency unit that satisfies all the criteria. So we cannot conclude that it is a copy.

This is the big difference between physical currency and digital currency: it should be impossible to spend the currency twice. This no double spending is one of the most important requirements of the system. It is impossible to see whether a bitstring is a copy or the original one and so to prevent that digital currency in the form of just a bitstring is spent twice or more times.

In the bitcoin system there is a public database, called a blockchain that keeps track of all bitcoin transactions. The owner of bitcoins possesses a reference to this database. And in this

database data can never be changed, data can only be added. So if there was a payment with some currency unit, it can be traced and so it cannot be repeated. Also in our system, with accounts and balances, there is a public database besides the information people store in their own database, i.e. the digital wallet on a smartphone. The information in the public database is essential in preventing actors to spend their currency unit twice. This implies that it is not possible to perform so-called off-line transactions, because it is always necessary to verify that the client is not spending the same currency twice. However it is possible to have an off-line payment system on top of the CBDC-system. This off-line payment system can be provided by banks or other financial service providers.

An important requirement is that the commercial banks does not become “Big Brother” so it must facilitate payments but it should not keep track of the money the actors possess. Of course it might be that the government wants to check for money laundering, but that will be done outside of the CBDC-system. In the next section we will show that it is sufficient to store a “fingerprint” of the transactions.

4.4 Challenges of Banknote Redesign and Physical Currency

According to Pillah (2023), the main goal of banknote redesign is to achieve certain goals, such as enhancing banknote security, preventing counterfeiting, protecting the nation's common legacy, managing the amount of money in circulation, and decreasing the total cost of currency management. From the literatures reviewed, the redesigning of the Naira is for economic reasons which is not limited to reducing inflation, combating counterfeiting, checking financial insecurity and reducing the money in circulation. Other research argued that the policy rids the economy of a lot of ‘black money’, thereby helping it improve the health of the monetary system which enables the regulators to monitor the flow of funds in the country (De Hei, 2010; De Hei, 2009).

Perceptibly, monetary policy is adopted by the Central Bank of Nigeria (CBN) to stimulate collective demand through adjustable changes in money supply and interest rate. It also plays an important role in the redesign of the currency. The purpose of the currency redesign is to mop up the huge amount of cash that is outside the banking system, which currently estimated at 2.73 trillion or about 85% of the total cash in circulation. Economic factors driving the redesign of the Naira include lowering inflation, thwarting counterfeiting, reducing insecurity, and increasing the amount of money in circulation, as it is believed that 85% of all the country's cash is hidden away in houses outside of the banking system. Nelson (2018) explained that monetary policy is a vital tool which could be used to achieve currency management, price stability, and strengthen the growth of investment.

Studies show that currency redesign is a good approach to manage the money in circulation (Pillah, 2023; De Hei, 2010; De Hei, 2009). Studies have shown that the urgent need to redesign and take control of currency in circulation in a country is to address the issue of hoarding of banknotes outside the banking system, the shortage of clean and fit banknotes in circulation, the increase in counterfeiting of high-denomination banknotes, interest rates and inflation, trade, laundering, market expectations among others may have resulted in the redesign of the naira note (Pillah, 2023; De Hei, 2010; De Hei, 2009).

A cycle of banknote redesign is generally aimed at achieving specific objectives, including but not limited to: improving security of banknotes, mitigating counterfeiting, preserving the collective national heritage, controlling currency in circulation, and reducing the overall cost of currency management. The currency redesign assists a country in the fight against corruption as

such exercise would rein in the higher denomination used for corruption, and hence, the movement of such funds from the banking system could be tracked easily. Again, the CBN has explained why it decided to redesign some naira notes. It acknowledges that the decision was taken because of the huge volume of counterfeit notes in circulation, money laundering and hiding of the naira notes amongst others. Based on this, the monetary policy of Nigeria is focused on easing the impact of shocks on the Nigerian economy which emanated from the various issues of the currency and developments in the global and domestic economies (Pillah, 2023; De Hei, 2010; De Hei, 2009).

5.0 Conclusion and Recommendations

The electronic money, digital cloud payments, banknote redesign policies and currency in circulation vis-à-vis relevance of cashless system and technology acceptance theory in Nigeria is a rarely covered topic. Design policies are used by central banks to give direction to the design process of banknotes. The study of the banknote design policies of the past century shows that 'technology-centred policies' are gaining popularity. Even cryptocurrencies such as Bitcoin, Ethereum, Facebook's Diem, Corda, Fabric and Ripple are competing for a spot in the cashless world, constantly reinventing themselves in the hope of offering more stable value, and quicker, cheaper settlement (Chapman, 2021; (Shao et al., 2021; Zhang & Huang, 2021).

The sole aim of introducing digital currency is to reduce the volume of physical currency in circulation which in turn destabilizes socioeconomic development of a country (Barontini & Holden, 2019). It is well-known fact that many people and businesses don't accept innovations especially the ones caused by technology. Finally, from the literatures reviewed, the redesigning of the Naira is for economic reasons which is not limited to reducing inflation, combating counterfeiting, checking financial insecurity and reducing the money in circulation. There has been a wide acceptance of electronic banking in Nigerian banks and technology has become more popular as service offering to customers have become more convenient, thereby, leading to an increase in competitiveness and profitability. There is a swift variation in the method of conducting business globally and in Nigeria, particularly which is borne from advancement in e-banking. Awolusi and Aduaka (2020) has said that it is becoming progressively difficult to satisfy customer expectations. The cashless economy does not imply an outright end to the circulation of cash (or money) in the economy but that of the operation of a banking system that keeps cash transactions to the barest minimum.

Bitcoin Ethereum and other forms of digital currencies or cryptocurrencies are powered by blockchain technology. Bitcoin has no physical representation like bills and coins and which is not issued or backed by any government or private corporation. Its value is determined by different factors, but the most important one is demand for it. When people buy Bitcoins its value increases; conversely, when people sell Bitcoins, it decreases. For this reason, its value tends to fluctuate a great deal (Bilotta, 2021).

Payment services provided by the private sector can effectively address the defects of fiat money. Therefore, central banks yield the authority of currency issuance to the private sector and allow it to issue currency backed by bank deposits or electronic money to build a payment system with wide coverage and diverse payment models (Qian, 2019). However, Ozili (2021) identified risks include digital illiteracy, increased propensity for cyber-attacks, data theft, and the changing role of banks in a full-fledged CBDC economy. Policy makers should harness the benefits of CBDC, and develop a regulatory framework for digital assets. And when implement it will help to address some of the risks associated with CBDC.

The research has shown that the future of cryptocurrencies can be bright if some institutional-formal conditions are met. The advantages of using cryptocurrencies in trade facilitation, cost reduction and others are recognized by the majority of academics. Bitcoin and other cryptocurrencies have the potential to replace traditional and new payment methods. But in order to achieve this and become the dominant force in the global payment system, they must provide a distinctive individual value, deal with and overcome a number of critical challenges, such as formal regulatory issues. It is unlikely to happen in a short period of time. Also, banks should carefully consider the technology underlying these cryptocurrencies as a potential generic new way of transferring ownership of the value over the long term. On the other hand, we have seen that cryptocurrencies as a new rise in society constitute a new way of transparent and fluid flow of resources that can spur every economy.

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