Band Digitalization And Challenges Of Implemented Central Bank Digital Currencies (Cbdcs)

~ ~ *Ph.D. Student* **Isabelle-Margareta Oprea** *(Romanian Academy, School of Advanced Studies of the Romanian Academy, Doctoral School of Economic Sciences, National Institute for Economic Research "Costin C. Kirițescu", Institute for Mondial Economy) ORCID: https://orcid.org/0009-0007-0647-8709*

E-mail: isabelle-margareta.oprea@ince.ro

Abstract: *The introduction of Central Bank Digital Currencies (CBDCs) has been motivated by several factors, including the accelerating pace of digital transformation, the declining use of cash, the emergence of cryptocurrencies, and the imperative to modernize payment systems. The paper undertakes a thorough examination of the development and implementation of CBDCs, with a particular focus on initiatives in the Bahamas (Sand Dollar), Nigeria (eNaira), and Jamaica (JAM-DEX). Utilizing a range of research methods, including a literature review and synthesis, as well as a comparative analysis, the paper assesses the benefits, challenges, and status of CBDC implementation. Key indicators analysed include financial inclusion, transaction efficiency, cybersecurity, and the impact on monetary policies. The study underscores the role of central banks in fostering user confidence and navigating the risks associated with financial innovation. It further emphasizes the necessity of a symbiotic relationship between public and private sector entities to formulate bespoke solutions tailored to the needs of each economy. CBDCs are regarded as an opportunity to curtail reliance on cash, combat money laundering and terrorist financing, and improve transaction transparency. The findings underscore the contributions of CBDCs to financial inclusion and the modernization of payment systems, while concurrently highlighting the bothers related to privacy, security, and user acceptance. The paper's conclusion asserts that CBDCs possess the potential to transform global financial systems, yet they require innovative designs, international collaboration, and strong strategies to overcome the associated risks and maximize benefits. Proposals for the future emphasize global*

standardization, the adaptation of policies for effective implementation, and the exploration of emerging technologies that could support their widespread adoption.

***Keywords**:* Bank Digitalization, Central Bank Digital Currencies (CBDCs), Implementation challenges, Financial inclusion.

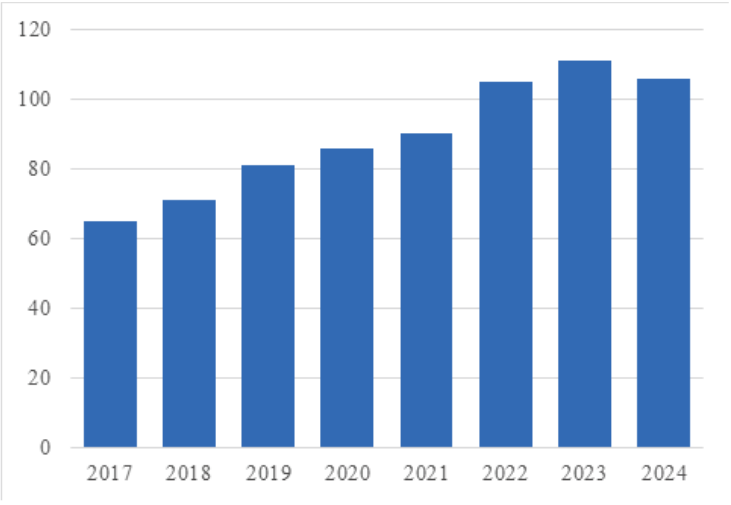
JEL: E42, G53, E58

1. Introduction

Central Bank Digital Currencies (CBDCs) represent a revolutionary innovation that marks a fundamental milestone in the evolution of global monetary and financial systems. These digital currencies offer new opportunities to streamline payments, promote financial inclusion, and increase transparency. However, they also address complex privacy, security, and regulatory provocations in an increasingly digitalized economy. CBDC, as a government-issued and regulated digital currency, signifies a paradigm shift in the nature of money, promising to improve financial systems by integrating the reliability of traditional fiat currency with the efficiency of digital payment technologies (Ozili, 2023). The conceptualization of CBDC has transitioned from theoretical frameworks to active investigation and experimentation, with central banks worldwide assessing its potential to modernize payment systems, increase financial inclusion, and fortify monetary policy (Kiff et al. , 2020).

According to Statista (2024), as of the end of 2023, more than 100 countries worldwide were engaged in the development of their own central bank digital currencies (CBDCs), although most of these initiatives remained in the research phase. Among the 105 countries engaged in the development of these digital currencies, only Nigeria, the Bahamas, Jamaica, and the Eastern Caribbean Currency Union (Anguilla, Antigua and Barbuda, Dominica, Grenada, Montserrat, St. Kitts and Nevis, St. Lucia and St. Vincent and the Grenadines) had an "operational" CBDC by the end of 2022, with the last project completed in January 2024. , as it can be seen in Figure 1.

Figure 1: Number of countries worldwide involved in developing a central bank digital currency 2017-2024



Source: Author's representation based on data obtained from Statista (2024)

According to the latest report by the Atlantic Council in September 2024, 134 countries, representing 98% of the global economy, are currently exploring the implementation of central bank digital currencies (CBDCs). This represents an important increase from the 35 countries that were considering the topic in 2020, and 66 countries have made major progress in their development efforts (Nagarajan, 2024). Meanwhile, the Bahamas, Jamaica, and Nigeria, countries that have already The Bahamas, Jamaica, and Nigeria, countries that have already launched CBDCs, are working to expand the use of their retail versions within national economies. In addition, 44 countries, including Australia, Indonesia, Singapore, and Malaysia, are piloting CBDC programs, compared to 36 countries that were at this stage last year. This trend underscores the intensifying global interest in the adoption of digital currencies (Nagarajan, 2024). The relevance of CBDCs arises in a context where traditional cash usage is declining. Concurrently, cryptocurrencies are gaining traction, and there is an increasing demand for fast, secure, and inclusive payment solutions. In contrast to decentralized cryptocurrencies such as Bitcoin, which are not supported by any government, CBDCs are issued by central banks and designed to function as a legal means of payment. This distinctive blend of digital efficiency and state backing positions of CBDCs as a potential solution to numerous problems in the modern financial ecosystem (Mancini-Griffoli et al. , 2018). The advancement of the internet, combined with the extensive adoption of smartphones and mobile applications, has catalysed innovation across multiple industries, with the financial sector being no exception. (Oprea & Draghici, 2024).

The introduction of a digital currency issued by central banks is driven by two major factors: the evolution of technological processes and the increasing complexity of consumer demands. These developments highlight a broader need to modernize financial systems. The progression of digital banking has enabled customers to access financial services through voice commands and touch interfaces, thereby minimizing the reliance on in-person transactions. (Oprea, 2023).

The emergence of digital payment methods and the proliferation of private cryptocurrencies have profoundly transformed the financial landscape, presenting hurdles for central banks and governments worldwide (Kiff et al. , 2020). Digital currencies such as Bitcoin, Ethereum, and Solana function outside the conventional banking system, providing decentralized and often unregulated alternatives to traditional currencies. While these innovations have promoted financial development, their volatility and vulnerability to misuse for illicit activities have highlighted the necessity for a more stable and regulated option (Sethaput & Innet, 2023).

To address this disparity, states are introducing digital currencies that offer the stability and trust associated with central bank-issued money, while also leveraging the advantages and efficiency of modern payment systems. These digital currencies aim to function as a secure medium of exchange, providing a state-backed alternative to cash in an increasingly digital landscape. Furthermore, the introduction of CBDCs has the potential to address inefficiencies in cross-border payments, reduce transaction costs, and promote greater financial inclusion (Mancini-Griffoli et al. , 2018). The potential for CBDCs to promote financial inclusion is particularly meaningful in regions where access to traditional banking services is currently limited. It is estimated that

approximately 1. 4 billion adults worldwide remain unbanked, lacking access to financial institutions or formal payment systems (Náñez et al. , 2021). CBDCs, delivered through mobile technologies and digital wallets, have the potential to provide an accessible and cost-effective financial instrument for these populations, thereby enabling their participation in economic activities and access to financial services.

In the context of financial inclusion, CBDCs hold the potential to improve the efficiency of national and international payment systems. Within the domestic environment, CBDCs can streamline payments by reducing costs and accelerating transaction speeds. In the context of international payments, CBDCs have the potential to transform the process, as they can facilitate direct, almost instantaneous transactions, thereby reducing the prevalence of high local fees, correspondent bank fees, and long settlement times (Kiff et al. , 2020). This can also offer increased transparency and accountability, which can contribute to the mitigation of fraudulent activities such as money laundering and tax evasion.

2. Literature review

CBDCs signify a progression in global monetary systems, propelled by technological advancements and the necessity to address the obsolescence of conventional payment mechanisms. These digital forms of fiat currency, issued directly by central banks, are intended to coexist with cash and bank deposits, thereby addressing the deficiencies observed in traditional financial systems. This innovation emerges in the context of declining cash use, increasing adoption of cryptocurrencies, and growing global digitization, positioning CBDCs as a cornerstone of modern monetary frameworks (Barrdear & Kumhof, 2022). By leveraging digital technologies, CBDCs promise to increase financial inclusion, improve transaction efficiency, and ensure system stability in an era characterized by rapid economic change (Nieborak, 2024).

CBDCs have been designed to meet several strategic objectives, from modernizing payment systems to strengthening monetary sovereignty. In contrast to cryptocurrencies, which are decentralized and privately managed, CBDCs are backed by the state, ensuring greater stability and trust. This state-backed nature allows CBDCs to reduce the risks associated with financial disintermediation and private digital currencies, thereby strengthening monetary sovereignty (Attarde et al. , 2024).

Another purpose of CBDCs, as analysed by Agur (2022), is their ability to provide a safe alternative to traditional financial assets, especially in times of economic and financial instability. As such, CBDCs can play a key role in building confidence in financial systems, providing a stable safe haven in times of crisis and helping to reduce systemic risks. These characteristics make CBDCs indispensable for promoting confidence in financial systems while fostering economic resilience (Agur et al. , 2022).

Furthermore, CBDCs are imperative for enhancing the efficiency of cross-border payments, a domain often characterized by high costs, delays, and a paucity of transparency in existing international transaction systems. By facilitating faster, more economical, and more transparent cross-border transactions, CBDCs contribute to the promotion of global financial

integration (Xiao et al. , 2024). In this manner, CBDCs optimize national and international payment ecosystems.

One of the most important advantages of CBDCs is their potential to elevate financial inclusion, particularly in underdeveloped regions. Initiatives such as Nigeria's eNaira underscore CBDCs' capacity to extend financial services to unbanked populations, thereby reducing reliance on conventional intermediaries. But on the other hand, the analysis of Niţoi & Pochea (2024) indicates that trust in the central bank exhibits a negative correlation with financial inclusion while demonstrating a positive association with wealth (Niţoi & Pochea, 2024).

By leveraging mobile and internet technologies, CBDCs facilitate pathways for economic participation among marginalized groups, democratizing access to financial systems (Conlon et al. , 2024).

In addition to promoting inclusivity, CBDCs offer secure alternatives to private cryptocurrencies, which often encounter issues of volatility and a lack of regulation. As government-backed instruments, CBDCs in still greater trust among users, facilitating the seamless adoption of digital payment systems, particularly in rural and remote regions (Lee et al. , 2021). Conversely, the Sand Dollar initiative in the Bahamas underscores the role of CBDCs in promoting financial inclusion in remote areas. By providing a digital alternative to cash, Sand Dollar has augmented access to financial services for remote communities, thereby demonstrating the potential of CBDCs to address regional disparities in affordability (Bofinger, 2024).

Despite the numerous advantages offered by CBDCs, tests must be addressed to ensure their effective implementation. Privacy concerns represent a salient issue, as the traceability of digital transactions conflicts with the anonymity associated with cash. Concerns about surveillance and potential misuse of personal data necessitate the development of strong privacy-enhancing technologies (Wang et al. , 2022). Another provocation is the risk of financial disruption. The implementation of CBDCs could potentially result in a shift of deposits from commercial banks to central bank accounts, thereby causing a destabilization of the conventional banking system. Such a deposit transfer could diminish the capacity of commercial banks to provide credit, which might lead to an escalation in the risk of banking panics during periods of economic downturns (Bitter, 2024). This disruption poses an important threat to financial stability and underscores the importance of designing CBDCs in a way that preserves the role of commercial banks in credit creation (Bindseil, 2019). The implementation of CBDCs varies across countries, reflecting different economic contexts and policy objectives. China's DCEP system is a pioneering example, using a multi-tiered registry design that balances centralization with privacy concerns. This system exemplifies the potential of CBDCs to improve domestic payment systems while preserving state control (Boar & Wehrli, 2021).

3. Research methods

To explore the status of representative CBDCs, a combination of documentary analysis and the comparative method was employed. A comprehensive array of academic databases, including Google Scholar and Web of Science, as well as industry reports issued by institutions such

as the Bank of England, the Bank for International Settlements (BIS), the European Central Bank (ECB), and the Central Bank of Japan, were selected for data collection. These sources were selected to ensure a comprehensive assessment that combines theoretical academic research with practical observations from the financial sector. The desk review involved the collection of data from secondary sources, including official central bank reports (European Central Bank, US Federal Reserve), academic studies, global databases (Atlantic Council's CBDC tracker), and published material from international financial institutions, such as the International Monetary Fund (IMF) and the Bank for International Settlements (BIS). Indicators analysed included the stage of implementation (full launch, pilot, research), key objectives (financial inclusion, payment efficiency), identified challenges (privacy, infrastructure, regulation), and anticipated benefits (cost reduction, transparency, economic resilience). In the comparative approach, selected CBDC features were analysed to identify similarities and differences between CBDCs, with a focus on the stage of implementation, difficulties encountered, and anticipated benefits. This methodological approach facilitated a comprehensive understanding of how diverse central banks and financial institutions oversee the development and implementation of digital currencies.

The incorporation of industry reports (gray literature) from reputable financial institutions confers a substantial advantage by offering information about the practical implementation of CBDCs. These reports provide privacy considerations from a regulatory perspective and underscore the experiences of central banks and regulatory organizations in addressing privacy concerns. A study by Adam R. J. (2017) demonstrated that integrating gray literature into systematic reviews contributes meaningfully to research credibility.

This methodological combination and diversity of sources provide a solid foundation for in-depth analysis of the current state of CBDC and for identifying future issues and opportunities in the field.

4. Results and discussion

4. 1. Sand Dollar

The Sand Dollar, initiated by the Central Bank of The Bahamas (CBOB) in October 2020, is the world's first fully operational central bank digital currency.

This initiative was developed to increase financial inclusion, given that a major portion of the Bahamian population does not have access to traditional banking services, particularly in remote islands. The initiative aims to provide a secure and accessible payment method for all citizens (Haans et al. , 2023). It also seeks to modernize payment systems to improve the efficiency and security of transactions while reducing the reliance on cash, which is often subject to problems such as counterfeiting and money laundering (Digital Euro Association, 2023), and strengthen economic resilience across the Bahamian archipelago (Central Bank of The Bahamas, 2020).

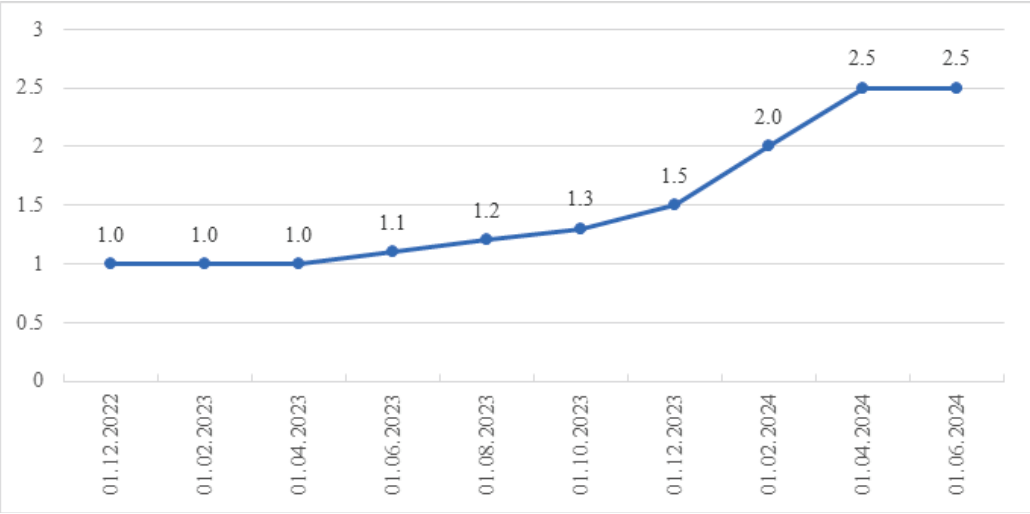
Sand Dollar operates as an account based CBDC, requiring user identification for transactions. The system incorporates three tiers of wallets with varying limits: the first tier comprises a basic wallet, with no KYC (Know Your Customer) requirements, limited to 500 Sand Dollars and

monthly transactions of up to 1,500; the second tier contains a premium wallet, which requires identity verification and allows up to 8,000 Sand Dollars and monthly transactions of 10. 000; the third tier includes a merchant account with no transaction limits but requires a business license and link to a bank account (Barzyk & Macek, 2022).

Although the Sand Dollar targets are ambitious, adoption has been slow, given that by mid-2022, only about 7. 9% of the population had used CBDCs (Digital Euro Association, 2023).

According to Figure 2, the CBOB data show a steady increase in Sand Dollar circulation, from about 1 million units in December 2022 to over 2. 5 million units in June 2024.

Figure 2: Sand Dollar in circulation (Amounts are in millions)



Source: Author's representation based on data obtained Atlantic Council (2024)

Sand Dollar caters to a diverse range of constituents, including individuals, businesses, and government entities. Notably, for residents of remote islands with underdeveloped banking infrastructure, it facilitates access to digital financial services through mobile wallets, thereby transcending geographical limitations (Alliance for Financial Inclusion, 2024). Businesses stand to benefit from reduced transaction costs and increased operational efficiency, while government agencies leverage the Sand Dollar to disburse social welfare and optimize tax collection processes. This digital currency fosters increased engagement in the digital economy, thereby promoting economic growth and development (Digital Euro Association, 2023). The Sand Dollar aims to promote financial inclusion by integrating unbanked and underbanked populations into the formal financial system, thereby addressing long-standing disparities in financial access. Transactions are executed instantaneously, reducing reliance on physical cash, and enhancing the efficiency of payments. Furthermore, the Sand Dollar supports cross-border trade and fund transfers, enabling more expeditious and economical international payments. Furthermore, the Sand Dollar facilitates the real-time transmission of transaction data, thereby improving the transmission of monetary policy and strengthening economic governance (Wenker, 2022). Its role in promoting economic resilience during crises underscores its value as a tool for financial stability.

However, the CBDC faces considerable problems. The pandemic has reduced the CBDC's outreach efforts, further slowing adoption rates during critical initial phases (Barzyk & Macek,

2022). Many citizens are not fully aware of the differences between public digital money and private bank money, which affects their willingness to adopt new payment methods (Haans et al. , 2023). Initial implementation has encountered uncertainties regarding the adoption of account-based or token-based systems, and the absence of a definitive framework for CBDC implementation has complicated early decisions (Digital Euro Association, 2023). The Sand Dollar implementation necessitated substantial investments in technology, infrastructure, and public education. Key expenditures included the implementation of strong cybersecurity measures, the development of a stable digital framework, and awareness campaigns to promote user adoption. Despite these costs, Sand Dollar remains a cost-effective solution for achieving The Bahamas' long-term financial goals (Central Bank of The Bahamas, 2022).

The Sand Dollar is pegged at a 1:1 ratio to the Bahamian dollar, thereby ensuring its stability and usefulness as a medium of exchange. This currency does not accrue interest, thus preserving its functionality as a payment instrument rather than an investment vehicle (Intereconomics, 2023). Relying on blockchain technology provides transparency, traceability, and increased security for transactions. The utilization of distributed ledger technology (DLT) in the Sand Dollar reduces potential risks, such as fraud and double spending, thereby enhancing public trust (CBOB, 2020). The Sand Dollar facilitates a wide range of financial activities, including person-to-person transfers, commercial transactions, and savings functions, contributing to its status as a versatile instrument within the Bahamian financial ecosystem (Digital Euro Association, 2023). The introduction of the Sand Dollar has implications for the Bahamian banking sector. The Sand Dollar's emergence has the potential to impact the revenue streams of commercial banks, which may see a decline in transaction and deposit fees as users increasingly opt for direct Sand Dollar transactions. To maintain competitiveness, banks must invest in digital infrastructure and develop complementary services. Concurrently, the Sand Dollar encourages banks to explore underserved markets, promoting growth and competition in the financial sector (Wenker, 2022). Moreover, central banks must judiciously balance the promotion of CBDCs with the need to avoid destabilizing commercial banks.

Sand Dollar is a landmark case study in CBDC implementation. While it has made progress toward increasing financial inclusion and the resilience of the Bahamian financial system, the slow pace of adoption highlights key struggles that future CBDCs must address.

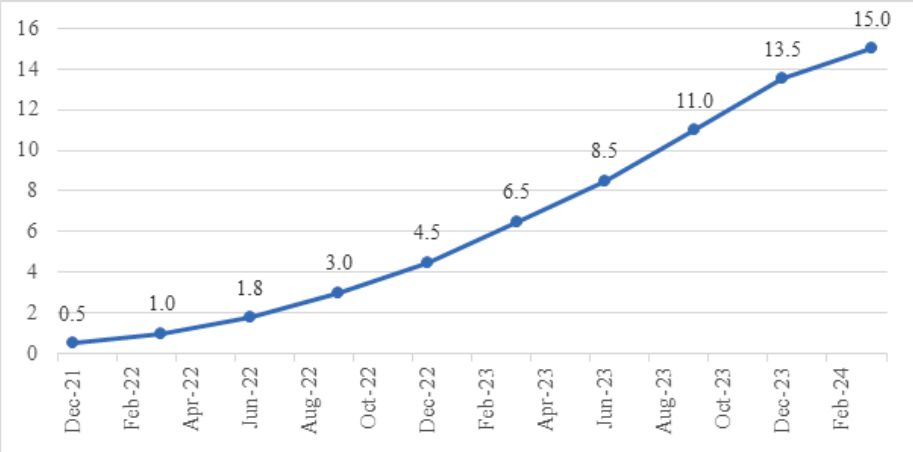
4. 2. eNaira

The eNaira, a Central Bank of Nigeria (CBN) initiative launched in October 2021, signifies Nigeria's pioneering role in the realm of Central Bank Digital Currencies (CBDCs) on the African continent. The eNaira's genesis was driven by the dual objectives of enhancing financial inclusion, reducing transaction costs, and optimizing the efficacy of monetary policy. As digital currencies gain global prominence, eNaira positions Nigeria as a leader in financial innovation on the African continent (Central Bank of Nigeria, 2021). The eNaira is designed for individuals, businesses, and government entities. For individuals, particularly those in rural areas, it facilitates access to digital financial services through mobile wallets, thereby overcoming the

constraints imposed by limited banking infrastructure. Businesses benefit from reduced transaction costs and increased efficiency, while government agencies use eNaira to distribute social handouts and improve tax collection (Okoye et al. , 2023). By providing a platform for efficient transactions, eNaira fosters greater participation in the digital economy (Adeleye et al. , 2024). This Central Bank Digital Currency (CBDC) promotes the financial inclusion of over 38 million unbanked Nigerians by addressing disparities in financial access. The instantaneous nature of transactions reduces cash dependency and improves payment efficiency, while also supporting cross-border trade and fund transfers, facilitating more expeditious and economical international payments. The capacity of eNaira to improve monetary policy transmission by furnishing real-time transaction data strengthens Nigeria's economic management (Ozili, 2023). Furthermore, its function in promoting economic resilience during crises renders it an indispensable instrument for financial stability (Okoye et al. , 2023).

Despite its initial underutilization, the eNaira's primary objective of promoting financial inclusion and digitizing payments in Nigeria has been met with notable progress. In its inaugural year, the adoption rate was less than 0. 5%, a figure that can be attributed to the government's efforts to incentivize its utilization (Nairametrics, 2024). According to data made available by the CBN (Figure 3), the value of eNaira in circulation had increased by 302% in nine months to over ten billion naira by March 2024, reflecting an increase in digital currency adoption of over 300%.

Figure 3: eNaira currency in circulation (Amounts are in billions)



Source: Author's representation based on data obtained Atlantic Council (2024)

However, the eNaira faces difficulties, primarily due to concerns regarding cyber security. Digital platforms are susceptible to hacking and fraud, which underscores the need for security measures to ensure the safety of financial transactions. Additionally, digital exclusion remains a salient issue, particularly in rural regions, where smartphone ownership and digital literacy are low. The proliferation of eNaira could potentially disrupt the banking system, thereby reducing the role of traditional banks and potentially destabilizing the financial sector (Ozili, 2023).

The implementation of eNaira necessitated substantial financial and infrastructural investments, including public education campaigns, cybersecurity measures, and the development

of a digital framework to ensure its stability and functionality. Despite these costs, eNaira is poised to be a cost-effective solution for Nigeria's financial ecosystem in the long term (Akanbi, 2023). The eNaira currency is pegged at a 1:1 ratio to the physical Naira currency, ensuring stability and usability. It does not generate interest, thus maintaining its role as a trading instrument. The eNaira's reliance on blockchain technology ensures transparency, traceability, and security of transactions (Adeleye et al. , 2024). By utilizing distributed ledger technology, eNaira reduces the risks associated with fraud and double spending, while increasing user confidence (Akanbi, 2023).

The eNaira operates on a two-tier model. The Central Bank of Nigeria (CBN) issues and regulates the currency, while financial institutions distribute it through mobile wallets. This model ensures integration with existing banking infrastructure while maintaining accessibility for users. The eNaira currency supports peer-to-peer transfers, commercial transactions, and saving functionalities, making it a versatile tool in the Nigerian financial ecosystem (Okoye et al. , 2023).

The eNaira has major implications for the banking sector in Nigeria. Okoye et al. (2023) posit that traditional banks may experience a decline in revenues from transaction fees and deposits as users transition to direct transactions in eNaira. To maintain competitiveness, banks must invest in digital infrastructure and develop innovative services to complement eNaira. Concurrently, the currency incentivizes banks to explore underserved markets and expand their digital offerings, thereby encouraging growth and competition in the financial sector (Adeleye et al. , 2024).

4. 3. JAM-DEX

The Central Bank of Jamaica (BOJ) launched JAM-DEX, its digital currency, in 2022 with the objective of fostering financial inclusion and increase the efficiency of the payments system. This initiative aims to provide unbanked populations and individuals residing in remote areas with limited banking infrastructure with access to digital financial services via mobile wallets (Noll, 2024). This digital currency reflects Jamaica's strategic approach to leveraging digital technologies to increase economic participation and address challenges in its financial system (Bank of Jamaica, 2022). JAM-DEX is designed for the unbanked and underbanked populations, addressing financial inclusion troubles by providing a digital payment option accessible through smartphones. It also supports small and medium enterprises by enabling secure and traceable digital payments. The JAM-DEX initiative seeks to empower marginalized communities and intensify their economic engagement by reducing barriers to entry into the financial system. Notably, the currency operates on a centralized ledger system, a departure from the decentralized nature of blockchain technology. This approach enables the use of "bearer digital instrument" tokens that can be transferred seamlessly through existing payment systems without requiring extensive identity verification or interaction with the central bank's ledger.

The Central Bank initiated the JAM-DEX program with an initial incentive program offering J$2,500 to the first 100,000 users, which resulted in a substantial but transient increase in circulation (Jamaica Observer, 2024). By the beginning of 2024, approximately 260,000 individuals

had initiated accounts, constituting approximately 9% of Jamaica's population (Human Rights Foundation, 2024). The integration of digital currency can facilitate streamlined payment processes and mitigate transaction costs for both consumers and businesses. This better efficiency is particularly salient in a cash-dominated economy where managing cash can incur substantial costs and present reliability concerns (Jamaica Observer, 2024). The existing financial infrastructure in Jamaica has posed obstacles to the easy integration of JAM-DEX into everyday transactions, and many merchants have been reluctant to adopt JAM-DEX because of the need to upgrade point-of-sale (PoS) equipment capable of processing digital currency transactions. The Central Bank has recognized this problem and is working to fund upgrades for existing PoS equipment (Ledger Insights, 2024). Merchants have indicated a predilection for maintaining their existing systems rather than adopting new systems specifically for JAM-DEX (Human Rights Foundation, 2024). The Jamaican government stands to benefit from JAM-DEX in terms of increased efficiency in the disbursement of social benefits and the collection of taxes. This capacity to leverage JAM-DEX fosters greater engagement in the formal economic sector and contributes to tax transparency (Noll, 2024).

The potential benefits of JAM-DEX include its capacity to improve financial inclusion by extending digital payment services to the underserved population. Furthermore, this Central Bank Digital Currency (CBDC) has the potential to facilitate more efficient and secure government payments, such as the distribution of social benefits, and to promote faster and more transparent transactions. These improvements are expected to encourage economic participation and to reduce transaction costs for businesses and consumers.

However, the implementation of JAM-DEX is not without risk. A notable concern is the potential for financial disruption, as the preference of users for CBDCs over traditional bank deposits could diminish the role of commercial banks in financial intermediation and credit creation. In addition, the lack of public education on the benefits and functionality of JAM-DEX has led to consumer apathy towards the adoption of this digital currency. Despite initiatives by the BOJ to raise awareness, the challenge of altering public perception persists as a barrier (Noll, 2024).

The implementation of JAM-DEX (Jamaican Digital Exchange) has profound ramifications for the Jamaican banking system. While complementing conventional banking services, JAM-DEX also prompts commercial banks to innovate. Consequently, banks must integrate JAM-DEX into their existing product offerings and develop complementary services to maintain their competitiveness in the financial market. The Central Bank is obligated to achieve a balance between the promotion of CBDC (Cryptocurrency-Based Digital Currency) adoption and the mitigation of other potential financial stability risks.

4. 4. Short comparative analysis

The digital currencies launched or in the process of being launched/developed reflect diverse approaches and objectives, adapted to the specific economic and social contexts of each country. To increase financial inclusion in regions with limited access to banking services, Sand

Dollar (Bahamas) and JAM-DEX (Jamaica) have been designed. Sand Dollar allows users to hold up to 500 units without identity verification (KYC), thereby facilitating access for financially underserved populations (Ozili & Alonso, 2023). Similarly, JAM-DEX (2022) offers a secure solution that is interoperable with existing payment systems and user-friendly (Coincub, 2023). In Africa, eNaira aims to supplant cash and appeal to cryptocurrency users, but it faces difficulties related to infrastructure and public acceptance (Ozili & Alonso, 2023). In developed economies, digital currencies are designed to improve payment efficiency while preserving privacy and integrating with existing systems.

The implementation of CBDCs exhibits considerable variation across nations. The Sand Dollar (Bahamas) has been fully implemented, yet its adoption remains limited due to inadequate public awareness and technological impediments (Ozili & Alonso, 2023). Conversely, the eNaira (Nigeria) experiences low adoption rates, with authorities undertaking initiatives to increase awareness and utilization (Ozili & Alonso, 2023).

Jamaica's JAM-DEX, despite its launch, is grappling with hurdles related to public perception and technological integration with existing systems (Coincub, 2023).

Table 1: Current status of the analysed digital currencies

CBDC	*Country/Region*	*Issuance date (year)*	*Status*
Sand Dollar	Bahamas	2020	Fully implemented, slow adoption
eNaira	Nigeria	2021	Launched, low adoption
JAM-DEX	Jamaica	2022	Launched, low adoption

Source: Author's representation based on data obtained from the analysis.

In conclusion, each CBDC faces specific provocations, but a well-developed financial sector with a high level of competition can offer more affordable options (Public trust and acceptance is a major hurdle, with many digital currencies viewed with scepticism due to privacy and government control fears. For example, negative media sentiment has contributed to low adoption rates for eNaira and Sand Dollar (Ozili & Alonso, 2023). The implementation of these digital currencies is further complicated by inadequate technological infrastructure, as evidenced by Nigeria's experience, where the absence of reliable infrastructure has hindered progress. Additionally, the regulatory framework constitutes a global challenge, necessitating a balance between innovation and consumer protection. A key objective of the banking sector is to mitigate financial and social disparities. (Duta & Oprea, 2024).

5. Conclusions

The study examined the evolution of central bank digital currencies (CBDCs), with a particular focus on those that have been implemented. The primary objective was to evaluate the success of these implementations, the extent of their acceptance by the public, and the challenges that have been encountered. While CBDCs hold considerable potential to improve and increase

financial inclusion, streamline payments, and reduce transaction costs, they are also confronted with problems. In particular, rural, and disadvantaged regions often have limited access to the internet and digital technologies, and the lack of digital literacy among the population hinders uptake. Complex regulations also complicate the balance between transparency, privacy, and security, especially in developed economies. The prevailing sentiment of public distrust, compounded by apprehensions regarding government oversight and data protection, acts as a deterrent to the widespread adoption of CBDCs. The success of CBDCs is contingent upon substantial investments in infrastructure, financial education, balanced regulation, and the cultivation of public trust. The implementation of these initiatives, in alignment with the needs of the population and the unique struggles faced by each region, holds the potential to elevate the banking system to the subsequent level of financial digitization.

It is imperative for central banks to recognize that the adoption and utilization of a digital currency, even one issued by them, is not a foregone conclusion. The experience of countries that have implemented CBDCs or are conducting large-scale pilots indicates that the adoption rate remains, on the whole, low, and limited. The study examined the evolution of central bank digital currencies (CBDCs), with a particular focus on those that have been implemented. The primary objective was to evaluate the success of these implementations, the extent of their acceptance by the public, and the issues that have been encountered. While CBDCs hold considerable potential to improve financial inclusion, streamline payments, and reduce transaction costs, they are also confronted with important difficulties. In particular, rural and disadvantaged regions often have limited access to the internet and digital technologies, and the lack of digital literacy among the population hinders uptake. Complex regulations also complicate the balance between transparency, privacy, and security, especially in developed economies. The prevailing sentiment of public distrust, compounded by apprehensions regarding government oversight and data protection, acts as a restraint to the widespread adoption of CBDCs. The success of CBDCs is contingent upon substantial investments in infrastructure, financial education, balanced regulation, and the cultivation of public trust. The implementation of these initiatives, in alignment with the needs of the population and the unique problems faced by each region, holds the potential to elevate the banking system to the subsequent level of financial digitization.

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