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**FACULTY OF SOCIAL SCIENCES**  
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**Role of Central Bank Digital Currencies in  
Bridging the Formal-Informal Economy Divide in  
Developing Countries**

Master's Thesis

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Year of the defence: 2024

## **Declaration**

1. I hereby declare that I have compiled this thesis using the listed literature and resources only.
2. I hereby declare that my thesis has not been used to gain any other academic title.
3. I fully agree to my work being used for study and scientific purposes.

In Prague on 28.04.2024

Pyae Soan Khaing

## References

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## **Abstract**

Informal economy has existed beyond regulatory frameworks alongside formal structures. This division persists in which the informal economy is often characterized by its unregulated nature that limits tax collection, financial inclusion, and social security. Given that the role of finance in formalizing the informal economy is mostly overlooked by governments and financial institutions, recent trends show a growing recognition of the importance of formalization through financial inclusion. In this context, Central Bank Digital Currencies (CBDCs) became one of the initiatives. This thesis explores the role of CBDCs in bridging the gap between formal and informal economies in developing countries. To understand the potentials brought by the CBDCs, the research examines CBDC projects in the Bahamas, Nigeria, and China through qualitative methods and evaluates against the international guidelines and frameworks from the Bank for International Settlements (BIS) and the International Monetary Fund (IMF). The results show that CBDCs can reduce informality by simplifying access to basic financial services, reducing transaction costs, and increasing transparency among the participants.

## **Abstrakt**

Neformální ekonomika existovala mimo regulační rámce vedle formálních struktur. Přetrvává toto rozdělení, ve kterém se neformální ekonomika často vyznačuje svou neregulovaností, která omezuje výběr daní, finanční začleňování a sociální zabezpečení. Vzhledem k tomu, že vláda a finanční instituce většinou přehlížejí roli financí při formalizaci neformální ekonomiky, poslední trendy ukazují rostoucí uznání důležitosti formalizace prostřednictvím finančního začleňování. V této souvislosti se jednou z iniciativ staly digitální měny centrální banky (CBDC). Tato práce zkoumá roli CBDC při překlenutí propasti mezi formálními a neformálními ekonomikami v rozvojových zemích. Abychom porozuměli potenciálu, který CBDC přináší, zkoumá výzkum projekty CBDC na Bahamách, v Nigérii a v Číně pomocí kvalitativních metod a hodnotí je podle mezinárodních směrnic a rámců Banky pro mezinárodní platby (BIS) a Mezinárodního měnového fondu (MMF). . Výsledky ukazují, že CBDC mohou snížit neformálnost tím, že zjednoduší přístup k základním finančním službám, sníží transakční náklady a zvýší transparentnost mezi účastníky.

## **Keywords**

Informal Economy, Financial Inclusion, Central Bank Digital Currencies, Developing Economies, CBDC Operating Model, Blockchain, DLT

## **Klíčová slova**

neformální ekonomika, finanční inkluze, digitální měny centrální banky, rozvojové ekonomiky, operační model CBDC, Blockchain, DLT

## **Title**

Role of Central Bank Digital Currencies in Bridging the Formal-Informal Economy Divide in Developing Countries

## **Název práce**

Role digitálních měn centrálních bank při překlenutí rozdílu mezi formální a neformální ekonomikou v rozvojových zemích

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This thesis is dedicated to everyone in Myanmar who is resilient through tough times yet still dreams of flourishing the country when the dawn breaks.

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## **1. Introduction**

The concept of informal economy has been a constant throughout human history and it keeps evolving into new forms and shapes. Since prehistoric times, we have come through trade, commerce, employment, and many other economic activities not regulated by formal institutions or government mechanisms. Simply, from the earliest bartering societies to today's bustling street markets, informality has been a companion to formalized systems. It was only the establishment of regulatory frameworks that created the dichotomy between the formal and informal economy. This division is defined between entities operating within the established administrative mechanisms and entities operating outside, as well as the division between workers who get the protection and those without.

Numerous terms have been referred to the informal economy including the shadow economy, black economy, underground economy, and hidden economy (Wu & Schneider, 2021). Scholars highlight that informal economic activity accounts for one-third of total output and informal employment accounts for one-third of the total employment (Elgin et al., 2021). Informal economy originates from illegal or unregulated means of production (Raijman, 2001). Tokman (1978) also contributes that other economic activities such as employment and wages can also be accounted for in the informal economy. The author argued that self-employed individuals or microenterprises that employ less than five people and pay low wages are also included in the informal economy. Clearly, informal economic activities erode tax and revenue collection, limit access to financial services and investments, and lastly, trap workers in unsecured employment. Formalization is required to bring these activities under the oversight of legal and regulatory frameworks to mitigate such undesirable market distortions.

The International Labor Organization (2016) argued that governments and financial institutions have paid little attention to the role of finance in formalizing the informal economy. One can observe several initiatives such as microfinance, mobile money, FinTech and Point-of-sale (POS) services, yet the financial exclusion gap persists for many, especially for those in remote areas or with limited access to technology and requirements. In this regard, central banks are trying to put formalization and financial inclusion efforts on their agenda. Especially, central Banks are exploring the possibility of issuing Central Bank Digital Currencies (CBDCs) to respond to private payment solutions and to increase

financial inclusion. According to Bose et al. (2012), developing countries are more likely to house large informal sectors and more likely to have small digital payment transactions compared to other countries. In response to this, Foster et al. (2021) argued the potential benefits of introducing central bank digital currency in developing countries. In fact, CBDC networks can bring a set of opportunities, in such a way that informal economy participants can obtain a unique identity to find new markets and secure job prospects and governments can improve taxation visibility and onboard informality to formality.

In this regard, this thesis analyzes how Central Bank Digital Currencies (CBDCs) can bring informal economic activities into the formal sector through increased financial inclusion.

## 2. Research Context

The past ten years have been flooded with the buzzwords of blockchain technology and digital assets. Driven by the growing popularity of Bitcoin, Tether (USDT), USD Coin (USDC), and DAI (DAI) throughout decades, not only the research output revolving around the distributed ledger technology and digital currencies, but also central bank digital currencies (CBDCs) is expanding. Especially, most research papers on CBDCs have concentrated on exploring the macroeconomic implications of introducing them into the economy. However, this field of study remains in its infant stage (Kosse & Mattei, 2023) and within this apprentice literature, the subset addressing financial inclusion and the informal economy is notably limited.

Policymakers have been commentating that CBDCs bring a significant opportunity to serve as a public good in two key capacities: firstly, as a form of public money backed by the central bank (Reserve Bank of New Zealand, 2021) and secondly, as a public monetary infrastructure, maintained by the central bank or another public entity (Bank of England, 2020). As CBDC will be a digitalized version of cash and easily accessible to the public, scholars and central banks have proposed that CBDC could be a ticket to expand financial inclusion efforts. The objectives of this research are:

- to investigate the impact of the CBDC adoption on access and usage of financial services in developing countries.
- to explore the affordances of the CBDC in means of financial inclusion.
- to evaluate the formalization mechanisms that will be channeled out by the CBDC adaption.
- to develop innovative planning and policies that will utilize the new money technology.

### 2.1 Research Questions

To examine the relationship between the role of Central Bank Digital Currencies and formalization in developing countries, this study seeks to examine the following research question: *How does CBDC adoption formalize the informal economy by enhancing financial inclusion in developing countries?* To answer this, it is important to understand how the CBDC adaption nurtures access to financial services. As identified by Emara et al.

(2016), access to financial services shrinks the size of the informal economy and onboards the participants in the informal sector to the formal sector. Accordingly, with CBDC being a recent money technology and public money, which differs from private money whose features can be specified based on how they are used, this study will focus on the relationship between the CBDCs and their accessibility. Therefore, to identify the relationship, the first sub-research question concerns: *What is the relationship between CBDC adoption and access to financial services?* After exploring this relationship, it is important to understand how informal economy participants use the CBDC once they have it in hand. According to Farazi (2014), small and medium enterprises from informal economies mostly rely on informal financial sources, for example, family, lenders, internal savings, etc. This means that the usage of bank accounts for investment and saving purposes is relatively low in such countries. Therefore, exploring the utilization pattern, especially for saving and access to credit will provide insights into understanding the potential impacts of CBDCs on financial inclusion. Hence, the second research sub-question centers on: *What is the relationship between CBDC adoption and saving habits, as well as access to credit, among informal participants in developing countries?*

## **2.2 Hypothesis of the Research**

The research hypothesizes that *“Evaluating the launched Central Bank Digital Currency (CBDC) Projects against established international guidelines will reveal varying degrees of effectiveness to bridging the formal-informal divide by enhancing financial inclusion within the informal economies of developing countries.”*

## **2.3 Research Methodology and Data Collection**

This research utilizes a qualitative research method. The primary method for this research is content analysis, which is again supplemented by document analysis. According to Bowen (2009), Corbin & Strauss (2008), and Rapley (2007), document analysis includes a systematic review and evaluation of documents to understand, extract and develop empirical knowledge required for the study. This method is often employed in conjunction with other qualitative approaches, known as triangulation - *“the combination of methodologies in the study of the same phenomenon”* (Denzin, 1970, p. 291).

The rationale for offering a qualitative method is that the design and operation of CBDCs may fall under the central banks and monetary authorities, yet their effectiveness and affordance ultimately depend on user experience and adoption. In addition, as the CBDC is still a growing academic literature, data availability presents limitations to performing a comprehensive quantitative data analysis. With this in mind, the paper will analyze guidelines from key institutions such as the Bank for International Settlements (BIS), and the International Monetary Fund (IMF), in which comprehensive frameworks for CBDC design, development, and their impact on monetary policy are provided (Discussed in Chapter 5). In the next chapter (Chapter 6), this research will examine fully employed and pilot tested CBDC initiatives from the Bahamas, Nigeria, and China to understand the practical implications of CBDCs. This research exclusively obtained data from online sources electronically.

## **2.4 Structure of the Research**

This thesis includes seven chapters. Followed by the Chapter (1) and (2), Chapter (3) offers a literature review on definitions and concepts of the informal economy and its participants, FinTech, Central Bank Digital Currencies, and their system and infrastructure. Chapter (4) presents the theoretical framework, in which the key barriers to financial inclusion and formalization will be discussed and how the CBDC can lift up those barriers and onboard the informal economy participants into the formal economy. Next, Chapter (5) will review the CBDC principles and guidelines published by International Financial Institutions, such as, the Bank for International Settlements (BIS), and the International Monetary Fund (IMF). Hereafter, Chapter (6) presents an empirical analysis and evaluation of three case studies using the guidelines discussed in Chapter (5). Finally, Chapter (7) concludes the research by testing the hypothesis and addressing the research questions posed in the introduction. Additionally, the chapter also discusses the limitations and potential possibilities for further research.

### **3. Literature Review**

Scholars assert that nearly 1.4 billion people are unbanked globally (Demirgüç-Kunt et al., 2022). In particular, one can observe that 77 percent of adults in low-income countries are financially excluded, for example, the proportion of adults who own a bank account ranges from 6 percent in South Sudan to 95 percent in high-income countries such as Canada, Germany, and the United Kingdom (Demirgüç-Kunt et al., 2022). This lack of financial inclusion can create significant and unwilling problems in the economic machine. The ability to get access to financial services offers different opportunities as such can stabilize income fluctuations, save funds to start a new business, mitigate the risk from disasters, and plan for family and personal growth (EY, 2017). Kendall & Voorhies (2014) also support that if an individual faces natural or man-made setback, one could reduce the risks by having access to saving accounts, insurance services, and remittances. However, several factors contribute to financial exclusion, which include limited financial literacy, lack of personal identification documents, geographical barriers, high costs, and lack of acceptable credit collateral (EY, 2017).

The World Bank conducted the Informal Enterprise Survey to understand the nature of informality. In the survey, it is observed that access to financial services is still the major obstacle to the development of small and medium enterprises (World Bank, 2022). On the other hand, Abraham and Schmukler (2017) also argue that Small and Medium Enterprises (SMEs) lack public information to get a loan from banks as it limits their creditworthiness and discourages the banks from lending money to such informal enterprises. There is one solution; financial inclusion efforts can enable SMEs to get access to financial services. For example, SME owners can open bank accounts and deposit their capital at commercial banks, in which they have to submit the required information for opening the bank account. This will not only create a track record but also obtain the required information to ease borrowing from the banks. One can observe several tools that can contribute to the financial inclusion efforts, including the CBDCs.

The CBDCs are a new concept brought about by the rise of digital currencies, and decentralized ledger technologies. Whereas most central banks are considering whether to issue their digital currency, there are only a few countries that have launched the CBDC, or either initiated the pilot test or introduced the proof of concept (Sun et al., 2022). On the

other hand, central banks see CBDCs as a potential solution to address financial exclusion, especially in low and middle-income countries where CBDCs can be a payment mechanism for the population outside the formal financial system. Researchers have not treated the gap in our understanding of CBDCs (Kosse & Mattei, 2023) and their potential impact on financial inclusion in much detail.

Following the research questions; exploring the relationship between the CBDC adoption and access to the financial services, the literature review will illustrate how the Central Bank Digital Currencies work and analyze their potential for financial inclusion. Specifically, the literature will review studies concerning formalization and financial inclusion to extract and present the drawbacks of informality and financial exclusion, followed by studies regarding CBDCs. Moreover, to attain an acute understanding of how CBDC works in real-life scenarios and how it is used, the user adoption characteristics are also reviewed. Thus far, the literature review is presented as follows.

### **3.1 Understanding the Informal Economy**

This thesis revolves around the core concept of the informal economy. The informal economy itself is a broad and contested term used in various scenarios in different perspectives of the academic realm. For long, the informal economy has been an unseen engine for development in both developed and developing countries, only the proportion between the formalized and informal activities tells the difference on whether the informal is a primary engine or rather a complementary force in other countries. The term “informal sector” was first used by Keith Hart in his study of urban markets in Ghana as part of the International Labor Organization’s (ILO) report (Hart, 1973). According to him, the informal sector comprises a range of activities from basic survivalist work to potentially profitable enterprises, yet they are unrecognized, unrecorded, unprotected, and unregulated (Hart, 1973). Loayza et al. (2009) argue that the informal economy means workers, enterprises, and their activities that operate outside the established regulations. On the other hand, Schneider et al. (2010) rather highlight that the informal economy includes economic activities concealed from government oversight to evade taxes and social security.

Thus far, there is little consensus on the rigid definition of the informal economy. Scholars of economic studies rather focus on the cash exchange of unregulated enterprises to find out



the total size of the informal economy (Gutmann, 1977; Feige, 1979). On the other hand, scholars from anthropology or social sciences tend to study the household's economic strategy and the role of informal economic activities in it; studying both cash and non-cash exchange between and within the households (Levitan & Feldman, 1991; Pahl, 1988). In 2002, the term "informal sector" was replaced with "informal economy" to reflect the extensive nature of the informality (International Labor Organization, 2013).

As explained in the introduction, this thesis will examine how CBDCs might promote financial inclusion, thereby bridging the gap between the formal and informal economy. In light of this multifaceted nature, the literature review will incorporate both economic and social science perspectives of the informal economy. L. Losby et al. (2002) proposed that informal economic activities happen in the context of informal work. The authors further explained that informal economic activities arise from the context of the labor market and the context of the work.

### **3.1.1 Understanding the Dual Nature**

According to the definition provided by Cross and Johnson (2000), the informal economy arises from informal work that involves individuals running small business, specifically on cash transactions or lack formal arrangements, and employees working off-the-books. The authors further differentiate the labor market into four categories; primary sector, secondary sector, informal sector, and illegal sector (Cross and Johnson, 2000) (see Table 3.1). The primary sector includes salaried positions with labor regulations and taxation, and the secondary sector includes jobs that are less regulated with less security compared to the primary jobs. For the informal sector, the authors asserted that the informal sector is composed of individuals who are excluded from the primary and secondary sectors with unregulated work arrangements. Finally, the illegal sector refers to all revenue-generating criminal activities.

**Table 3.1 Informal Sector and Labor Market Categories**

Primary Sector	Secondary Sector	Informal Sector	Illegal Sector
<ul style="list-style-type: none"> <li>• Well compensated</li> <li>• High security</li> <li>• Highly regulated</li> </ul>	<ul style="list-style-type: none"> <li>• Poorly compensated</li> <li>• Low Security</li> <li>• Poorly regulated</li> </ul>	<ul style="list-style-type: none"> <li>• Self-employed</li> <li>• Temporary works</li> <li>• Unregulated</li> </ul>	<ul style="list-style-type: none"> <li>• Unlawful activities</li> <li>• Unregulated</li> </ul>

Source: Adapted from Cross and Johnson (2000)

In contrast to Cross and Johnson's (2020) findings, scholars argue that even those in the primary sector may choose to participate in informal activities either as their main source of income or to supplement their primary earnings (L. Losby et al., 2002). International Labor Organization (2018) proposes a different concept of informal economy that informal employment (work) is based on the context of the work. International Labor Organization (2018, p. 12) posits that

*“Employment in the informal economy = Employment in the informal sector + informal employment outside of the informal sector (i.e., informal employment in the formal sector + informal employment in households).”*

It was the first to set up criteria for the informal economy, arguing that one needs to consider two important components: the employment within the informal sector and the informal employment outside the formal sector. The first one includes small and medium enterprises and works such as street vendors, small repair shops, or unregistered construction workers. The latter includes work arrangements within the formal business, but the individuals are employed casually for specific or short-term work off-the-books (International Labor Organization, 2018; L. Losby et al., 2002), such as family members contributing unpaid labor to a family-run business.

On the other hand, scholars described the informal economy by identifying its characteristics. For example, Rajjman (2001) asserted that production arrangements that produce economic activities can either be legally regulated or unregulated. These activities

are not unlawful in nature, but some actions may violate non-criminal regulations, such as failing to file taxes or complying with labor laws (Raijman, 2001). In addition, L. Losby et al. (2002) argued that the legality of the product engaged in economic activities may also be an indicator to differentiate between informal activities and criminal activities. For example, the street vendor selling hamburgers may not have a proper selling permit or fail to pay taxes, yet the hamburgers are legal. On the flip side, the street drug dealer would be completely different as the product itself is illegal.

With respect to informal economic activities, McCrohan et al. (1991) pointed out that cash is a primary means of payment in the informal economy, as cash, rather than electronic payment, can bypass the record of activities. The concept of “off-the-books” describes this type of arrangement, in which certain transactions are also made by bartering goods or services (L. Losby et al., 2002). Based on this concept, L. Losby et al. (2002) again claim that such transactions are not recorded so that the income is not reported for taxation in the informal economic activities. For example, McCrohan et al. (1991) highlight that it is challenging for the government to oversee all the economic activities to be reviewed, taxed, and regulated, thereby creating a gap between the informal economic activity and the government’s ability to monitor it. A further definition of informal economic activity is given by Castells and Portes (1989) who describe the informal economy in terms of the circumstances under which workers are employed including labor regulations, health and safety measures, and the placement of operations that violate zoning laws. For example, the workers in the informal sector may be offered inferior benefits compared to formal employment such as without the minimum wage and any legally mandated benefits like unemployment insurance or social security (L. Losby et al., 2002). Marcelli et al., (1999, p. 580) offer an example that reflects the overall mechanics of informal economy as follows.

*“Selling oranges in a grocery store is a formal economic activity. Selling them on a highway exit ramp in Los Angeles County to passing motorists is an informal activity. Likewise, producing T-shirts in a factory where labor and health standards are not enforced is an informal economic activity.”*

To conclude this section, the literature identifies informality based on its dual nature to understand the different perspectives of the scholars contributing to both the characteristics of informal economic activities and the context within which they operate.

### **3.2 Money Dynamics and CBDC**

Before we discuss the CBDCs and their effect on financial inclusion, it is crucial to understand the concept of money. Money can be cash/banknotes in our wallet, money can be the balance we see in our bank accounts or money can also be a credit card. We must first answer the question “What is money?” to understand “How new money, like CBDCs, will fit in the economy and help us achieve financial inclusion?”

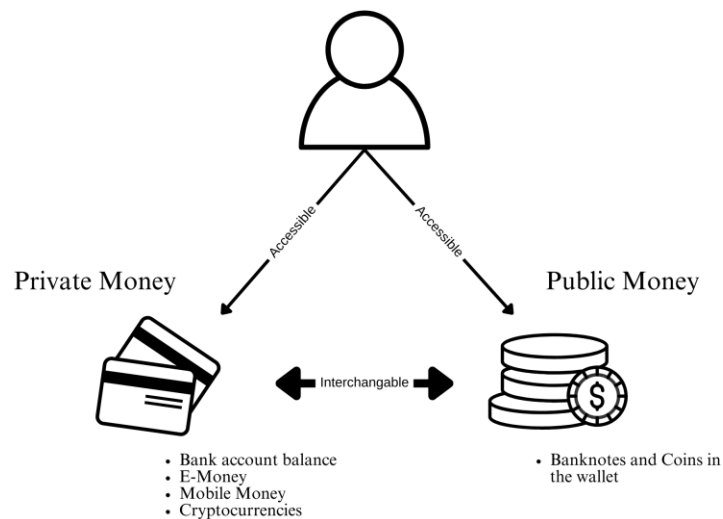
For Mishkin (1986), money can exist in different ways regardless of form and shape, yet it serves for three distinct purposes: (1) Money as a medium of exchange. (2) Money as a unit of account. (3) Money as a store of value. However, scholars posit different typologies of money. Laidler (1969) describes that money includes both physical currencies, currently in circulation and demand deposits held within commercial banks. In addition, Gurley and Shaw (1960) asserted that one should also include liabilities from non-bank institutions such as savings and loan associations. Unlike the scholars mentioned above, Infante et al. (2022) have shown that the existing economic system allocates different forms of money, such as physical money (cash) and account-based money (deposits). There is no agreed definition of what constitutes money. However, the Bank for International Settlements offers a recent definition of money by dividing it into two categories: Public Money and Private Money. Public money includes central bank-issued liabilities, such as physical banknotes and reserves held by commercial banks. In contrast, private money means deposits and e-money issued by commercial banks and non-bank financial institutions (Bank for International Settlements, 2023). Given that money is the core concept of this research, one needs to understand its multifaceted nature.

A Central Bank Digital Currency is a form of digital money created by the central bank as a legal tender. A short definition of CBDC is provided “... *an electronic form of central bank money that could be used by households and businesses to make payments and store value*” (Bank of England, 2020, p. 7). Reserve Bank of New Zealand provides a broader definition that

“CBDCs, like physical cash, attach a legal claim to the central bank, with their inherent value rooted in the trust placed in the government and its institutions” (Reserve Bank of New Zealand, 2021, p.9).

On the other hand, the European Central Bank (2023) writes that central bank money is physical banknotes and coins issued by the central bank and they represent public money, whereas private money refers to demand deposits or other credit-based instruments that commercial banks create through loan issuance. Regarding this typology, Central Bank Digital Currency is a type of public money issued by the central bank (European Central Bank, 2023).

Reserve Bank of New Zealand (2021) claims that individuals can make payments using either public money (cash) or private money held in their bank accounts to check their balances, withdraw money, or make transactions. Figure (3.1) illustrates this concept that individuals are accessible to both public money and private money to make payments, in a way that the form of money can be interchanged as preferred.

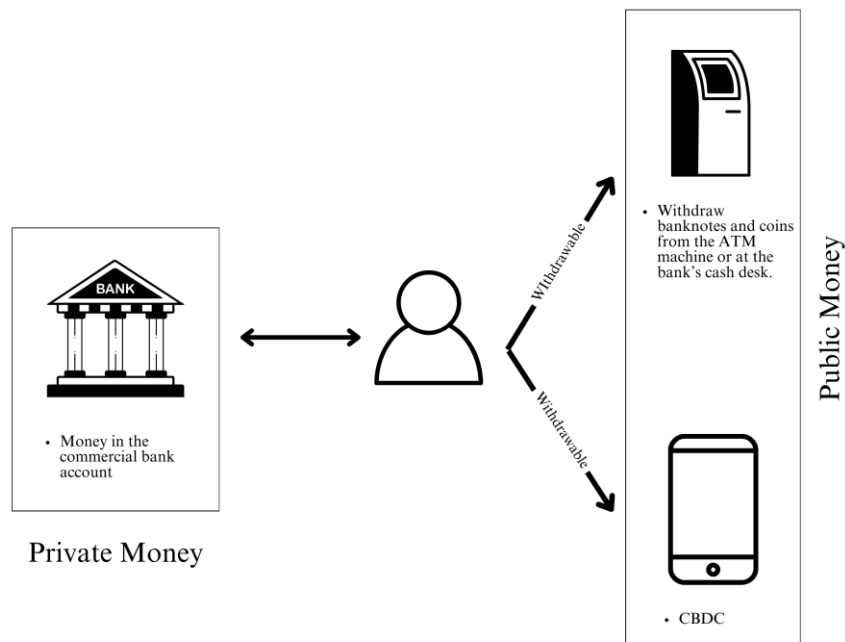


**Figure 3.1: Dynamic between Private Money and Public Money**

Source: Adapted from Reserve Bank of New Zealand (2021)

On the other side, central banks provide a new approach of accessing the public money through the issuance of CBDC. According to Bank of England (2020), European Central

Bank (2024) and Reserve Bank of New Zealand (2021), public will get access to public money both physically as in cash and digitally as in CBDC. For example (illustrated in Figure (3.2)), a person who wants to withdraw money from his/her bank account will have two options, either withdrawing as cash or as a CBDC. This process will be the same for depositing money at the bank.



**Figure 3.2: Transfer process of money in CBDC economy**

*Source: Adapted from Reserve Bank of New Zealand (2021), Author's Elaboration*

According to them, central bank digital currency is electronically issued, and liabilities to the central bank, which serve as a medium of exchange and a store of value (Meaning et al., 2018). On the other hand, Griffoli et al. (2018) view CBDCs as different from the reserves of commercial banks as CBDCs are a new form of digital money issued by the central banks. In this regard, Auer et.al (2020) claim that central banks could issue *retail CBDC* (general purpose) and *wholesale only CBDC*. Narula et al. (2023, p. 12) defines that

*“Retail CBDC is a direct liability of the central bank unlike commercial bank money, Fast Payment Systems (FPS), or e-money, which is again fully digital so different from the physical cash. Additionally, individuals or businesses can directly hold the retail CBDC, unlike central bank reserves.”*

On the other hand, one can observe a significant difference between the retail and wholesale CBDCs. Committee on Payments and Markets Infrastructure (2018) defines the wholesale CBDC as a parallel to the traditional central bank reserves that can potentially enhance the risk management within the interbank payment systems and not for the use of general public. According to the definitions mentioned above, money is not limited to physical forms or the reserves in the commercial bank. The CBDCs present as a new form of money issued by the central bank, maintain the characteristics of money, and possess the same features as cash of public money. This research will primarily focus on the concept of *retail CBDCs*. Narula et al. (2023) claims the introduction of the retail CBDC to the economy is not a complete replacement of existing forms of money. Scholars suggest that CBDC should coexist as a complementary to cash and other existing payment methods (Maurer et al., 2018; de Sardan & Piccoli, 2018). Choi et al. (2021) assert that central banks will be equipped with better regulatory tools to address numerous policy objectives such as economic growth, financial inclusion, and economic innovation if the CBDC is designed carefully.

This approach is similar to that found in Murray (2019, p.1), that CBDC can potentially offer *“a more stable unit of account, a more efficient medium of exchange, and a more secure store of value compared to existing digital payment options.”* and it can be denoted as a next step in the evolution of money (Griffoli et al, 2018, Wang et al., 2022). The academic works on CBDCs are several that one can group into four categories (Hoang et al., 2023); impact on local and open economies, supply-side monetary perspectives, financial inclusion, and cross-border payments. In addition, Adams et al. (2021) and Pocher & Veneris (2021) propose that CBDCs can bridge the anonymity gap between cash and digital payments. To provide context to CBDC, table (3.2) shows the characteristics, similarities, and differences of money-like assets currently circulating in the economy.

**Table 3.2: Characteristics of CBDC and other money-like assets**

	CBDC	Cash	Deposit	Bitcoin	USDC
Liability of Central Bank	Yes	Yes	No	No	No
Interest Bearing	?	No	Yes	No	No
Public Money	Yes	Yes	No	No	No
Private Money	No	No	Yes	Yes	Yes
Digitally stored and transferred	Yes	No	Yes	Yes	Yes
Universal Access	Yes	Yes	Yes	No	No
Cryptocurrency	No	No	No	Yes	Yes

*Source: Meaning et al. (2018), Narula et al. (2023), Author's Elaboration*

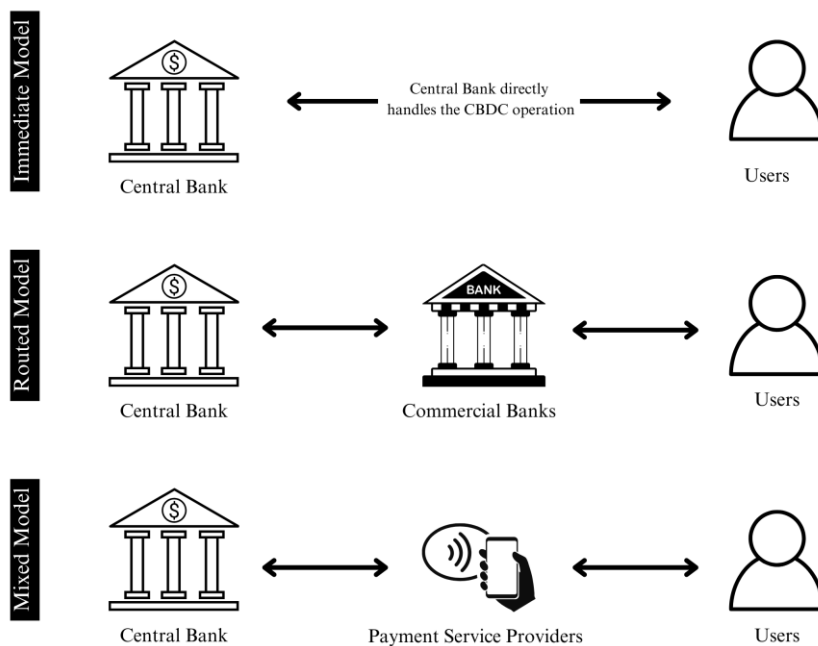
Auer et.al (2020) suggest two approaches for issuing the CBDC: account-based and token-based. The Account-based system simply employs the conventional payment system, similar to bank deposits in the current financial system (Auer et al., 2020). On the other hand, a token-based system is alike the crypto assets that employ the Distributed Ledger Technology (DLT) (Auer et al., 2020). In this regard, the central banks are left with two distinct options to issue the CBDC (Auer and Böhme, 2020). Scholars have guided different approaches on how the CBDC should be operated in the economy, primarily focusing on the sole role of the central bank, or setting an intermediary landscape (e.g., Allen et al., 2020; Auer & Boehme, 2020; Kanovitz, 2022). However, regardless of varying terms, one can find a consensus in typologies, which include;

- Immediate Model in which the central bank directly handles the CBDC operation and distribution.



- Routed Model in which the central bank issues the CBDC and the intermediary bank (a commercial bank) manages and distributes it.
- Mixed Model in which CBDC is claimable on the central bank while designated payment service providers (PSPs) manage user identification and facilitate retail payments.

These models are visualized in Figure (3.3).



**Figure 3.3: CBDC Operating Models**

*Source: Adapted from Reserve Bank of New Zealand (2021), Auer et al. (2020) and Author's Elaboration*

However, there is no agreed option on how the Central Bank Digital Currency is issued or distributed (Auer et al., 2020). Based on the International Monetary Fund's reports, Sun et al. (2022) pointed out that all six of the currently existing Central Bank Digital Currency pilots and launched projects include an intermediated party that manages and distributes the CBDC. Similarly, the Atlantic Council's CBDC Tracker (2024) indicates that, out of 119 ongoing projects, none are actively pursuing the immediate model, with 75 remaining undecided.

### 3.3 Fintech, Digital Currency, and Financial Inclusion

Moving on now to consider what is FinTech in the literature review. For many years, the world has benefited from digital innovations in the Finance industry, and some have become the main infrastructure to bridge financial inclusion. Are digital currencies still considered FinTech? What is the difference between the FinTech we have seen so far and the new money technologies to come?

Digital or virtual currency has existed for some time as one can find the Mobile Money and E-Money concepts in the current FinTech Landscape (Foster et al., 2021). The concept of Mobile Money was launched in East Asia and the Pacific in 2001 (Suri & Jack, 2016). Since then, it has become one of the earliest financial services that serve the underbanked population, and one has witnessed a surge in Mobile Financial Service Operators across the year (Dermish, 2011; Tobbin and Kuwornu, 2011; Foster et al., 2021). According to the definition provided by Suri and Jack (2016, p. 1288), mobile money services allow users to *“store monetary value on a mobile phone and send it to other users via text messages”*. Gencer (2011) asserts that mobile money covers a broader range of mobile financial services such as mobile payments, mobile finance, and mobile banking. The mobile money bypasses the need for formal financial institutions so that it becomes a prominent infrastructure for financial inclusion (Foster et al., 2021). On the other hand, one has seen E-money technology where transactions are made via a mobile application or other digital platform. European Union (2009) defines that E-money is *“a digital alternative to cash which allows users to make cashless payments with money stored on a card or a phone, or over the Internet.”* Examples of E-money include Visa, Mastercard, and PayPal (Firpo, 2009). There is a significant difference between Mobile Money and E-money that, according to Foster et al. (2021), E-money is linked to a user’s bank account or a credit card to store values and make payments whereas mobile money does not require a traditional bank account.

Despite these technologies in the FinTech landscape, one needs to look closely at new money-creation systems accompanied by DLT or non-DLT technologies. Following the Lehman crisis in 2008, Nakamoto (2008) introduced Bitcoin, a decentralized money that operates on the blockchain, specifically, the distributed ledger technology (DLT) in which every participant of the decentralized economy maintains a secure record of transactions.

Some claim that Bitcoin is a private currency free from government control (Cao et al., 2023), yet scholars argue that Bitcoin does not meet the money criteria: unit of account, medium of exchange, and store of value (Yermack, 2015). According to the Corporate Finance Institute (2023), digital currency is a broad term that encompasses all digital monetary assets. It is possible to regulate or deregulate the digital currency. However, regardless of the entity whether it is a sovereign or a private organization, digital currencies represent an innovation in payment systems (Foster et al., 2021).

To date, some scholars argue that cryptocurrencies, especially, stablecoins can promote financial inclusion (Adams et al., 2023; Catalini et al., 2022). As Narula et al. (2023, p. 15) point out, *“the affordances of cash make it a critical backstop against [financial] exclusion...It remains the lowest requirement on payment mechanism above which some exclusion will always occur.”* Regarding this, stablecoins such as tether (USDT) or circle (USDC) offer their collateral to the U.S. dollar, which is less volatile compared to some local currencies and other cryptocurrencies, in addition, the decentralized nature of such stablecoins circumvent the need for traditional account-based systems so that they present a more accessible alternative (Kim, 2023). On the other hand, Central Bank Digital Currencies (CBDCs) are legal tender digital currencies (Reserve Bank of New Zealand, 2021) and they should also exclude private intermediaries to offer more accessible financial services (Kim, 2023).

However, to realize financial inclusion with the above-mentioned technologies, user adoption should be inclusive and adopted by every layer of society. According to Bijlsma et al. (2021), there is a positive correlation between the users' willingness to adopt the CBDC and their degree of trust in the central bank and financial institutions. Zhou & Huang (2022) also supported that existing behavior to use mobile wallets and payment platforms also influences CBDC acceptance. In addition, the user adoption of CBDC also relies on balancing user privacy and compliance regulations. Jiang (2020) writes that potential users of CBDC prioritize privacy and are more inclined to safeguard their transaction history from unauthorized access as decentralized cryptocurrencies and cash itself offer. However, CBDC is considered a tool in response to cryptocurrencies, there is a tradeoff between privacy considerations and institutional concerns such as money laundering, financial crimes, and compliance (Rennie and Steele, 2021).

## 4. Theoretical Framework

According to Schneider et al. (2010), informality refers to market-based economic activities outside the formal regulatory framework. These informal activities are often motivated by multifaceted incentives. This being said, the incentives can be economic, regulatory, or institutional (Schneider et al., 2010). Individuals could participate in informal activities if they can avoid taxation, regulatory fees, or compliance costs as if the costs of such are high and avoidance becomes an option. Perry et al. (2007) and Ulyseia (2020) also acknowledge that diverse factors such as regulatory burdens (e.g., avoidance of legal and administrative requirements) and weak institutional settings (e.g., corruption, inconsistent regulations, and reduced enforcement) influence the decision to engage in the formal sector. On this point, such actions directly contradict the core principle of financial inclusion, which emphasizes the utilization of formal mechanisms such as having a unique identity, registration, or account such as bank accounts and credit.

While some may claim that existing financial instruments such as mobile banking and mobile money services can offer sufficient solutions to expand the financial inclusion and formalization efforts and thus a new form of money technology is not required, a significant global population stays unbanked for high transaction fees, distance with service providers or mobile connectivity. *This thesis theorizes that Central Bank Digital Currencies can address these challenges and reduce informality by enabling financial access for informal participants.*

To assess this possibility, the chapter offers a two-pronged approach. Firstly, it discusses the main barriers that informal sector participants face to financial inclusion, followed by the barriers to onboarding the formal mechanisms. Hereafter, the theoretical reasoning of how the introduction of CBDCs could offer the potential to overcome these barriers and facilitate a proper formalization. Nonetheless, the CBDC adoption will also pose potential limitations, which will be discussed in the last. Previous studies of financial inclusion have dealt with barriers to financial services. Hanohan (2008) and Demirgüç-Kunt et al. (2022) define that low income, cost of financial services, geographical challenges, lack of identification, inadequate education, and gender can be the barriers to financial inclusion. The Global Findex Survey highlights that sixty-two percent of the unbanked population cited “lack of money” as a main barrier to financial services (Demirgüç-Kunt et al., 2022). Again,

Demirgüç-Kunt and Klapper (2012) assert that a lack of sufficient income limits the unbanked population from opening bank accounts in which they are required to pay for initial deposits, transaction fees, and minimum balances. Perhaps, this creates the start of a circle that lack of access to financial resources further hinders financial inclusion efforts.

In addition, it is important to remember that one has to present a unique identification to have a bank account. This is evident in the case of Know Your Customer (KYC) regulations which ask for official identification and credit histories for opening a bank account/ mobile money account. Atkinson and Messy (2013) outline that such identification and document requirements are troublesome for unbanked people already marginalized by the financial system. By way of illustration, this is particularly evident in regions with low income, for example, in Sub-Saharan Africa, thirty-seven percent of adults mentioned that they do not have a financial service account because of insufficient documentation. Moreover, according to EY (2017), some financial institutions also ask for additional documents such as utility bills with verifiable addresses, which again pose further barriers to the unbanked population, especially for those who lack a stable residency. Because of this, Atkinson & Messy (2013) identified that documentation barriers push the unbanked population towards informal financial products. This interpretation is in contrast with that of Demirgüç-Kunt et al. (2021) who argue that unbanked individuals do not need an account as one of the family members already has one. Taken together, these scholarly works suggest that reliance upon informality is either a choice or necessity but both options contradict the works of financial inclusion.

Furthermore, many unbanked populations live in rural areas where financial institutions are far away. Several factors pose limited physical accessibility to financial services in many places. In some economies, for example, unbank individuals cited they live in remote areas with limited access to physical bank branches (Demirgüç-Kunt et al., 2022). In India, forty-three percent of unbanked individuals cited distance as the reason they are unbanked (Demirgüç-Kunt et al., 2022). Several factors pose limited physical accessibility to financial services in many places. Likewise, Demirgüç-Kunt and Klapper (2012) highlight that the distance between the unbanked individuals and the nearest bank branch or ATM is miles away. Atkinson and Messy (2013) argued that another aspect of distance from financial institutions, in which authors claim that lack of financial infrastructure is rooted in a combination of practical considerations (e.g., small customer base, logistical challenges),

limited profitability, and security concerns about handling the cash in such remote areas. Consequently, such barriers leave a large number of populations underserved for financial services.

Another important barrier to financial inclusion worth noting is education. In this context, Demirgüç-Kunt et al. (2022) describe that individuals with low education levels are also financially excluded. In particular, the authors highlight that account ownership rates are typically low for those with primary education or less. Ngugi et al. (2010) also highlight that illiteracy and low financial knowledge significantly contribute to financial exclusion, in which individuals are unaware of different financial options and unable to utilize financial services. In addition, Atkinson and Messy (2013) argue that financially excluded individuals fail to understand how financial services work and how they are eligible to use the services. The Demirgüç-Kunt et al. (2022) illustrates that individuals with higher levels of education have more account ownership compared to people with lower education. On the other hand, Morsy and Youssef (2017) offered a different perspective on financial exclusion, claiming that gender also plays a role as a barrier to financial services, as men are more accessible to financial services than women. In light of this, Aterido et al. (2013) argued that the financial gap happens because of gender differences as women tend to have a lower level of income, education, and formal employment in various countries. Notably, Honohan and King (2012) assert that there is a clear link between trust and financial inclusion, where authors argue that individuals lacking trust in the financial system are less likely to hold bank accounts.

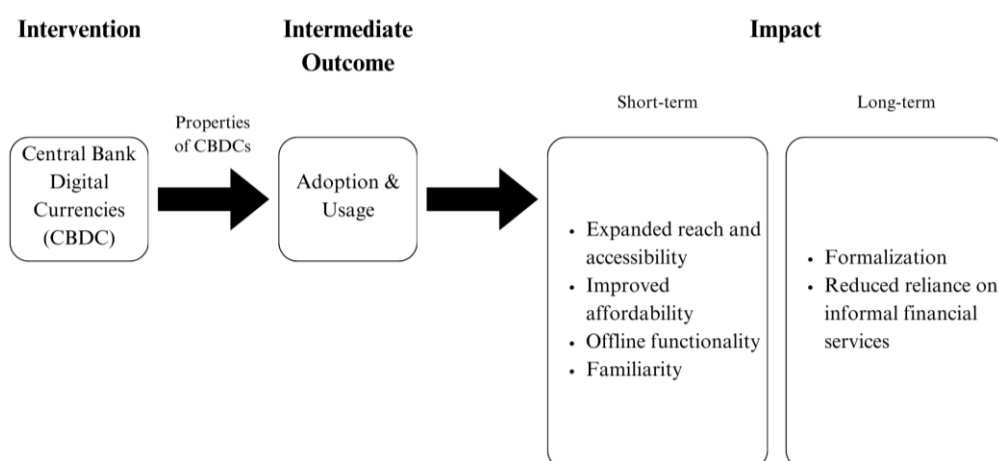
Crucially, it is evident that barriers to financial inclusion hinder formalization in developing economies. This is because informal firms struggle to invest in technologies that can enhance the productivity of the firms as simply as they do not have access to credit (Capasso and Jappelli, 2013). Honohan and King (2012) offer a different perspective that by measuring the number of available bank branches, ATMs, access to credit, and account ownership, it is observed that regions with greater financial inclusion have significantly reduced informality. In addition, expanding financial access efforts through established bank branches and private sector credit institutions leads to a decline in informal activity (Honohan, 2008). Having discussed the decline in informality, Honohan (2008) and Honohan and King (2012) highlight that removing the institutional barriers, such as high transaction costs and inconsistent regulations can improve the trust between the informal economy participants

and the institutions. These concepts support that better governance with formal and inclusive institutions can further provide equal access to financial services and formalization within developing economies. Altogether, it is important to recognize two distinct groups for understanding the landscape of financial exclusion in the informal economy (Acemoglu et al., 2014);

- *Self-exclusion* as firms and individuals who obtain their financial needs through informal financial services.
- *Systemic exclusion* as firms and individuals who face external barriers to accessing financial services.

In light of this, Central Bank Digital Currencies can offer new opportunities to onboard the unbanked population to financial inclusion and potentially address the barriers to formalization. This concept is theorized and visualized in Figure (4.1). The first phase would be the introduction of CBDC into the economy which yields a widespread adoption of the CBDC as an intermediate outcome. Subsequently with user adoption, the introduction of CBDC is expected to yield short-term impacts for financial inclusion such as accessibility to financial services and familiarity to the CBDC platform, followed by long-term impacts on formalization.

Context: Financial Inclusion to Formalization



**Figure 4.1: Theoretical Framework**

Source: Adapted from Lannquist and Tan (2023).

Particularly, Lannquist and Tan (2023) argued that the similarities shared between the CBDC, and the physical cash are the main reasons that will drive individuals to adopt the CBDC platform. Unlike banking or mobile money services, both physical cash and the CBDC are the central bank money as channeled as the common payment methods for the unbanked who primarily engage in small-scale transactions with the benefits of widespread accessibility, low transaction cost, privacy preservation, and trust (Lannquist and Tan, 2023). In addition, CBDC will likely exempt the minimum required balances, and formal identification for small transactions and offer offline functionality (Lannquist and Tan, 2023). Hence, CBDCs preserve a potential solution to lift the geographical, income, and education barriers. Nonetheless, to replicate cash and “bridge the gap” for financially excluded individuals, it is crucial to design them with specific features that address those identified barriers (Lannquist and Tan, 2023).

However, one needs to acknowledge that CBDCs offer promising benefits, but over-optimism can obscure potential pitfalls. These new types of digital currency/payment methods require not only universal access but also active adoption. Three reasons ultimately influence the adoption of mobile financial services, as argued by Alampay et al. (2017). These are (1) knowledge about the service, (2) access to the service, and (3) perceived benefit from that service (e.g., lower fees, offline payment, relaxed identification requirements). As discussed above, existing payment solutions are considered enough for onboarding to financial inclusion and formalization. However, critics argue that rather than benefiting the unbanked population, financial inclusion often serves to expand the market for private financial services (Kar, 2018; Ozili, 2020; Prabhakar, 2021). Lannquist and Tan (2023) endorsed that central banks can offer CBDC services cheaper and more accessible unlike other payment options as the central banks themselves are not profit-driven institutions. Finally, increased CBDC adoption can act as a basic framework for formalization by bringing individuals and firms into the formal financial system.

On the other hand, despite these potential solutions brought by the Central Bank Digital Currencies, one needs to acknowledge the barriers to CBDC adoption, for example, digital inclusion. Dai et al., (2023) use the term “digital inclusion” to refer to affordable and reliable access to digital devices and mobile connectivity, which in turn is a pre-requisite for digital payments, including CBDCs. Supporting this argument, Lannquist and Tan (2023) assert

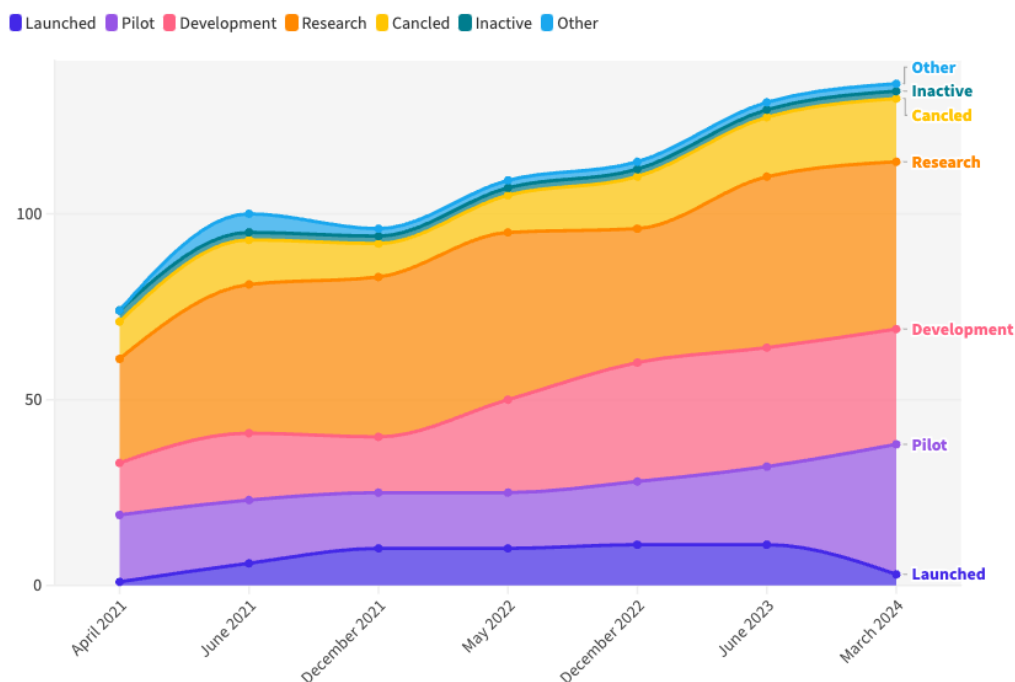


that the underbanked population prefers to use cash to make payments due to unreliable internet and mobile connectivity in remote areas. Cash also acts as the main payment in locations prone to natural disasters and internet outages (Lannquist and Tan, 2023). Narula et al. (2023) identifies that people often save their money in both cash and digital forms for greater control of their money and to mitigate complexity, which becomes another barrier to CBDC adoption.

Thus far, the theoretical framework argued that Central Bank Digital Currencies (CBDCs) can bridge the financial exclusion gap, and its byproduct, informality in developing countries. This chapter mainly explored the key barriers faced by the unbanked population to achieve access to financial services. CBDCs that offer accessibility, familiarity, and lower transaction costs could potentially overcome these hurdles and promote financial inclusion and formalization.

## 5. International Guidelines on CBDCs

The research for the central bank digital currencies has gained its momentum. As of 2024, 134 countries are in the research or development stage while the Bahamas, Jamaica, and Nigeria have launched their official digital currencies. The exploration status of CBDCs is presented in Figure (5.1).



**Figure 5.1: CBDC Exploration Status**

Source: Atlantic Council. *Central Bank Digital Currency Tracker as of 2024*

Yet the countries are observing the interoperability of CBDCs, each represents its own motivations; the Bahamas Sand Dollar aims to improve the financial inclusion in its borders (Central Bank of Bahamas, 2017) whereas e-CNY claims to improve the E-Commerce in the country (People’s Bank of China, 2019). The European Central Bank (2023) asserts that the Digital Euro will improve the eurozone integration and improve the payment landscape in Europe, yet the Federal Reserve places the Digital Dollar differently that the CBDC aims to mitigate the systemic risks in the country’s financial system (The White House, 2022). Concerning this, it is important to examine the international principles and standards for the research and development of central bank digital currencies, especially to understand the

framework of how CBDCs can be designed to address specific priorities of different economies.

This chapter explores one of the key foundations of the thesis: the selected international principles and guidelines published by international and national monetary authorities and institutions. The following guidelines will have a closer look for a thorough investigation.

- BIS CBDC foundational principles and core features (October 2020)
- IMF CBDC Virtual Handbook (September 2023) NOTE/2023/007 (A Dynamic Decision-Making Framework) and NOTE/2023/008 (A Guide to CBDC Product Development)

The rationale for choosing these guidelines for the in-depth exploration is as follows.

- The BIS CBDC foundational principles and core features report is developed by the major monetary institutions the Bank of Canada, European Central Bank, Bank of Japan, Sveriges Riksbank, Swiss National Bank, Board of Governors Federal Reserve System, and Bank for International Settlements itself. Furthermore, the guiding principles and features revolve around developing a retail [general purpose] CBDC and attaining the monetary and public policy objectives through the CBDCs. The central banks contributing to this guideline likely have a commonality in the technology and policy design of their CBDCs. Regarding this, taking into account the BIS CBDC guidelines in this research is mandatory.<sup>1</sup>
- The IMF recently released a CBDC virtual handbook and emphasized its role in helping the policymakers and monetary authorities understand the dynamic landscape of central bank digital currencies. The virtual handbook consists of five parts which focus on the guideline principles for developing and managing the CBDCs in the economy, prior analysis of monetary policy implications, and opportunities and risks brought by the CBDCs. In addition, the IMF supervises the policy and development alternatives of the Bahamas Sand Dollar in collaboration with the Central Bank of Bahamas under the Article IV regulations. The IMF is also

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<sup>1</sup> The author's additional reasoning for choosing this guideline is that the guiding principles are also informing the design of the mBridge Cross-Border Wholesale CBDC Project, a collaborative effort led by the BIS and four central banks, including the People's Bank of China (PBoC). While the PBoC did not participate in developing the joint report for retail CBDCs (rCBDCs), the foundational principles outlined within it are applied in the development of e-CNY project.

collaborating with BIS to develop the research and guidelines regarding the CBDCs. These efforts presented here illustrate the requirement to include IMF's CBDC Guidelines in this research.<sup>2</sup>

## **5.1 BIS CBDC Foundational Principles and Core Features**

The Bank for International Settlements released Foundational Principles and Core Features regarding the development and implementation of the Central Bank Digital Currencies in October 2020. Several central banks of the major economies such as the Federal Reserve, European Central Bank, and Bank of Japan participated in developing the framework into motivations, principles, and potential implications associated with the CBDC issuance. The guideline argued that there has been a shift in means of payment accompanied by a decline in cash usage and an increase in digital payment solutions, which then motivates the central banks to intensify research on the development of CBDCs. In addition, the guideline was made explicit that each country has a unique motivation and independent authority on whether or not to issue the CBDC. The guidelines articulate that only when the CBDC introduction potentially maintains monetary and fiscal stability, the responsible institutions move forward with the implementation. This includes: a coexistence of CBDC with existing forms of money and promoting efficiency within the system. According to BIS, it is the responsibility of the host country to avoid the *“adverse impact of a CBDC on bank funding and financial intermediation, including the potential for destabilizing runs into central bank money”* (Bank for International Settlements, 2020, p.1) The guidelines emphasized that only an informed judgment can mitigate the potential risks so that issuing country needs to incorporate safeguards into the CBDC design and broader financial policies.

The first sections of the guideline discussed the role of the central bank in its decision-making framework. The next section clarifies the foundational principles that central banks should maintain in a way that also maintains their mandate for monetary and financial stability. The foundational principles include (Bank for International Settlements, 2020):

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<sup>2</sup> The author's additional rationale for choosing this guideline is that the Bahamas Sand Dollar is regarded as the first official CBDC to launch in the global scale. It is also the first CBDC to be assessed by the IMF to oversee the potential opportunities and challenges associated with the CBDC implementation.

- A CBDC should not disrupt the existing monetary and financial systems.<sup>3</sup>
- A CBDC should coexist with cash (already existing central bank money) so that users can choose freely among the available options, while the central bank sustains the single, unified currency in the economy.
- A CBDC should complement private money rather than replace it, and the central bank should remain committed to providing either cash or a CBDC as long as public demands exist.
- The CBDC platform should endorse innovation and efficiency in the existing payment ecosystem so that users can integrate into the system.<sup>4</sup>

These above-mentioned principles are taken as mandatory for a country to issue CBDC in the economy. In addition, the BIS further discusses the core features and technical considerations. The guidelines state the importance of CBDCs to offer user-friendly delivery and accessibility to ensure public trust and adoption. In that principle, the potential CBDC users will be able to easily convert CBDCs to cash and vice versa. The guidelines also assert that CBDCs should be widely available with minimal technological and cost barriers. Furthermore, the BIS also recommended that the CBDC system ensures resilience to cyberattacks and outrages while also offering large-scale settlements between the accounts in the system. Finally, the guidelines emphasized the role of the central bank and related public institutions in establishing clear legal and regulatory frameworks.

In addition to the BIS CBDC foundational principles and core features that directly deal with the central bank's role to ensure the delivery of CBDC, it is also important to highlight the general features that focus on the systemic level that

- BIS and collaborating central banks declare to play an important role in understanding the implication of whether or not issuing the CBDC in their jurisdictions

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<sup>3</sup> BIS emphasised this practice as “Do no harm” principle.

<sup>4</sup> This principle of “Innovation and Efficiency” in the existing payment landscape is only generally described in the guidelines rather than clarifying the specific role of CBDC; as CBDC being a platform for public-private partnerships, or as CBDC being a foundation platform for all the payments in the economy.

- The importance of building an international dimension of cross-border payments into CBDC designs
- Active involvement and information-sharing among stakeholders include central banks from developing countries and international institutions to ensure interoperability between domestic CBDCs.

## 5.2 IMF CBDC Virtual Handbook

IMF CBDC Virtual Handbook is the most recent guideline released on CBDC development and issuance. Specifically, NOTE/2023/007 and NOTE/2023/008 cover the design perspectives of the central bank on designing the technical and regulatory portions of the CBDC, and the potential framework for managing the CBDC framework. Similar to BIS foundational principles, the IMF states that CBDC issuance can either improve or damage the overall monetary and financial landscape, so an informed judgment is required. Specifically, the NOTE/2023/007 (Tourpe et al., 2023) covers the technical aspects of the design and the overall management of the CBDC project, such as how the authorities should organize the CBDC team, approach the CBDC concept, and develop and test the prototype. Furthermore, the IMF discusses the role of private-public partnerships in developing the technical infrastructure and the importance of evaluating the CBDC prototype before deciding whether to move forward. Turning now to the detailed perspective of the CBDC virtual handbook, the main difference compared to the BIS’s core principles is that the IMF proposes a planning process rather than discussing it in a generalized approach. The paper introduces the 5P methodology as five sequences in developing an operational CBDC and introduces a “go/no go” process during the transitions between the stages.<sup>5</sup>

NOTE/2023/008 (Soderberg et al., 2023) is a complementing report that rather focuses on policy considerations and decision-making frameworks. The guidelines cover the role of setting up policy objectives and analyzing of success matrices of each objective. Likewise, the BIS’s foundational principles, the IMF also emphasized the central bank’s mandate to

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<sup>5</sup> The IMF identifies “5P Methodology” in developing the CBDC; Preparation, Proof-of-concepts, Prototypes, Pilots and Production. In addition, IMF proposes a well defined assessment at the intersection of each phase and only to continue the transition if the previous phase passed the assessment which is called “go/ no go checkpoints.”

safeguard the monetary and fiscal stability if CBDC was issued in the economy. Besides, the guidelines state that central banks should invite the stakeholders to be involved in the design, development, and implementation of the CBDC project. Specifically, the IMF proposed five thematic areas that central banks can potentially invite multiple stakeholders; central bank functions, public sector, financial and private sector, payment system infrastructure, and service provision (Tourpe et al., 2023). For the design scheme of the CBDC, IMF guidelines state that the design choices of the CBDC are directly related to attaining the policy objectives of the central bank. Unlike the BIS foundational principles, the IMF guidelines fill the gap that the CBDC design should also incorporate specific design features such as designated type of CBDC accounts and transaction limit, remuneration, potentials of programmability, possible privacy and anonymity schemes, and cross-border and offline functionality.<sup>6</sup> In addition, the guideline states the importance of a legal framework for certainty and accountability for the central bank and either incorporating or drafting new updated regulations to AML/CFT principles. Depending on the scale of the CBDC, the IMF emphasized that the central bank is not the sole institution for legal and regulatory accountability and that collaboration between multiple institutions is required to protect user rights and mitigate fraud risks.

### **5.3 Summary**

Although there are similarities in the overall content and scope available for CBDC design and development, both the Bank for International Settlements and the International Monetary Fund offered their emphasis and unique factors. Each principle and guideline were more focused on the importance of a well-informed decision-making process and maintaining the existing monetary and fiscal landscape before and after issuing the CBDC. Yet, it is found that IMF guidelines lack a strong foundation for CBDC issuance while the BIS's foundational principles highlighted the need for the CBDC to coexist in the existing system. However, it is found that these principles are more general and lack guidance on the technical aspects.

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<sup>6</sup> While BIS's foundational principles address similar design features, they are framed as opportunities and risks. In contrast, the IMF offers potential scenarios with assumed cases.

On the other hand, it is observed that IMF's "CBDC Virtual Handbook" focused on a structured approach to CBDC where the IMF sees the CBDC in a project management framework. The handbook introduces the 5P methodology to develop an operational CBDC, accompanied by "go/no go" checkpoints at each stage. In addition, unlike the BIS principles, the IMF also proposes specific design features for consideration, such as types of accounts available on the CBDC platform, transaction volume, settlement rate, and privacy outlines. However, the IMF handbook can only be described as a technical detail as it did not cover the core functionalities of CBDCs themselves. In summary, it has been shown from this review that BIS foundational principles are more focused on providing a solid foundation to issue a CBDC with a clear purpose. At the same time, the IMF handbook builds upon these principles with a practical framework to navigate through the technical and regulatory challenges.

To understand the role of the CBDC in bridging the formal-informal gap in developing countries, it is important to develop key parameters that reflect the overall CBDC landscape situation in that country. In this regard, the following structure (Table 5.1) derived and adapted from the abovementioned guidelines will be used as a benchmark to evaluate the upcoming case studies.



**Table 5.1: Key parameters to be employed in the case studies**

	Description
<b>Block I</b>	
Motivation for CBDC issuance	<ul style="list-style-type: none"> <li>• What are the reasons behind the central bank's objectives for issuing the CBDC?</li> </ul>
Policy Objectives	<ul style="list-style-type: none"> <li>• What are the specific goals that the central bank aims to attain by issuing the CBDC?</li> </ul>
Target Population	<ul style="list-style-type: none"> <li>• What is the targeted population segment that the CBDC is designed to reach?</li> </ul>
<b>Block II</b>	
CBDC Architecture and Infrastructure	<ul style="list-style-type: none"> <li>• What does the CBDC operating mode look like?</li> <li>• What kind of technology is employed?</li> <li>• What is the tradeoff between privacy and functionality?</li> <li>• What are the distribution channels?</li> </ul>
Interoperability	<ul style="list-style-type: none"> <li>• Can the CBDC integrate with existing payment systems?</li> </ul>
CBDC Product Features	<ul style="list-style-type: none"> <li>• What are the services attached to the CBDC?</li> <li>• What are the functions of the CBDC product?</li> </ul>
<b>Block III</b>	
CBDC economic profile	<ul style="list-style-type: none"> <li>• What is the circulation of CBDC in the economy?</li> </ul>
User Adoption and Profile	<ul style="list-style-type: none"> <li>• How can the users access and onboard themselves onto the CBDC platform?</li> <li>• Who is using the CBDC platform?</li> </ul>
Use Cases	<ul style="list-style-type: none"> <li>• How can individuals use CBDCs for everyday transactions?</li> <li>• How can CBDCs enable SMEs to conduct cashless transactions with customers and suppliers?</li> </ul>

## **6. Case Studies**

This chapter conducts a comprehensive review of selected launched and pilot CBDC projects. The author chose CBDC projects from the Bahamas, Nigeria, and China to reflect the overall effectiveness of the CBDC issuance in improving financial inclusion and bridging the gap between formal and informal economies. The rationale for choosing these projects as case studies is as follows;

- The Bahamas and Nigeria's CBDC projects are considered as first operational CBDCs in the global context.
- China's CBDC project, regardless it is still in the pilot stage, is the biggest pilot project and the most advanced CBDC in interoperability within its economy.
- All three countries include financial inclusion and formalized economy as policy goals and motivations for issuing the CBDC.

### **6.1 Digital Bahamian Dollar Sand Dollar**

The Bahamas' Sand Dollar, introduced in 2020, is recognized as the first commercially launched CBDC in the global landscape. Accompanied by a small economy and geographical differences, the Central Bank of the Bahamas (CBoB) foresees the introduction of a CBDC as a tool that will bind the economy and onboard the financially excluded people into the formal economy. Unlike other technological and economic giants working on the development of CBDCs, it is plausible to look at the Bahamas to understand how the central bank positions the CBDC that fit with the country's economic landscapes. The research and development of Sand Dollar was not an alternative initiative of the central bank, but it rather inherits the Bahamian Payments System Modernization Initiative which was started in the early 2000s. Along with the development of DLT technology, the CBoB started to consider its own digital currency to reduce cash usage and promote digital payments in its island nation. This is explicitly mentioned by the CBoB that the government anticipates itself as a key participant and user of the CBDC platform to reduce the economic costs associated with handling physical cash and to improve taxation and expenditure mechanisms of the government.

Moving on now to consider the CBoB's motivations for issuing the Sand Dollar which revolve around improving the economic efficiency in the country. Specifically, the Bahamas is a small economy comprised of 700 islands with only 30-40 inhabited, with a population

of 400,000<sup>7</sup> and a GDP of \$13.88 billion (IMF, 2023). In addition, the official currency of the country is pegged to the USD at a 1:1 exchange rate. However, regardless of a relatively stable currency compared to other countries, the geographical dispersion deliberately affects the economic efficiency and the coverage of financial services across the country. CBoB claimed that digital payments for money transfers and bill payments are low at just 40%. Another reason contributing to this existing environment is that, according to the CBoB consumer satisfaction survey (2018), 78% of the respondents claimed that it is expensive to get access to and use the financial services available in the country.<sup>8</sup> As compared to the guidelines described in Chapter (4), CBoB has developed clear policy motivations and goals for developing the CBDC. It claims that

- Sand Dollar aims to improve financial inclusion among the islands, especially in remote communities where the CBDC can obtain KYC data so that banks can provide basic financial services including deposits and credits.
- Sand Dollar aims to onboard commercial activities into the formal economy to improve the government's tax collection.
- Sand Dollar can potentially prevent illicit abuses to the Bahamas financial system.

It is observed that the Sand Dollar shares the same principles as the BIS's CBDC foundational principles that the CBDC is not replacing yet coexisting with the fiat Bahamian Dollar. In terms of financial stability safeguards, CBoB claimed that the central bank will set up a maximum amount of sand dollars that one can hold in his/her Sand Dollar account to prevent large withdrawals during the financial crisis. Such an approach is new in terms of the CBDC landscape, nevertheless, it is plausible that such limitations can ease volatilities in small economies such as the Bahamas. Furthermore, this also aligns with BIS's principles that a country decides to design and issue the CBDC that fits with the country's economic system. Moving next, one can recognize that the Bahamas Sand Dollar aligns with IMF's 5P methodology; CBoB completed proof of concept and prototype phases prior to launching

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<sup>7</sup> Permanent Mission of The Bahamas to the United Nations in Geneva. "The Bahamian Economy," December 3, 2021. Accessed April 9, 2024. <https://www.bahamasmission.ch/the-bahamian-economy/>.

<sup>8</sup> The CBoB's consumer satisfaction survey claimed that the respondents are reluctant to use the financial services as the banks charge monthly fees and ATM withdrawals irrespective of whether the ATM belongs to the bank where the account was opened or a different bank.

the pilot tests. In addition, CBoB included private partners to evaluate the core infrastructure, which also shares the same concepts with the 5P methodology. Likewise, NZIA Synapse was selected as a private partner to host Sand Dollar infrastructure. In 2019, CBoB ran a pilot test for Sand Dollar, however, it is unconventional that CBoB launched the formal nationwide level after 10 months of pilot project. According to the Sand Dollar whitepaper, the digital currency is entirely based on the DLT, yet the payment system is tiered to both account-based and token-based systems (Central Bank of the Bahamas, 2019). Before proceeding to examine the economic profile of Sand Dollar, it is important to examine how it is distributed and operated among the end users. CBoB operates a Routed Model in that the central bank issues the Sand Dollar and oversees the Sand Dollar wallet when the authorized financial institutions distribute the Sand Dollar to the end users.

In addition, CBoB claimed that Sand Dollar Wallet offers online/offline functionality for both personal and business accounts, each with different levels of KYC and amount holding limits. Users do not need ID or other documents to open low-value personal accounts so they can access basic banking services anytime, yet the wallet limits the total balance and the total amount of transactions carried out by the low-value wallet users. On the flip side, one can observe a potential inconsistency according to the Sand Dollar website, even though the users are not required to have official documents to open a Sand Dollar account, they are mandatory to connect with authorized financial institution e-wallets. In addition, it is observed that the Sand Dollar wallet offers offline functionality, and such a feature will contribute largely to users in a geographically dispersed country like the Bahamas. Last but not least, according to the Central Bank of the Bahamans (2023), approximately one million Sand Dollars (roughly equivalent to one million USD) were circulating in the Bahamian economy, with an estimated user base of 110,000 individuals.

## **6.2 eNaira**

Financial exclusion has always been an important issue in Nigeria. The Central Bank of Nigeria (CBN) has developed several initiatives, such as mobile money Point-of-Sale services and Bank Verification Numbers (BVN), to onboard onto financial inclusion. eNaira, the official CBDC of Nigeria, can be regarded as one of the CBN's initiatives to onboard

financial inclusion. It is the second most launched CBDC globally.<sup>9</sup> CBN started the consultation and development to issue its digital currency in 2017 (Central Bank of Nigeria, 2021). The design principles of the eNaira are unique in the sense that, unlike other CBDC projects, CBN tried to base the currency on the existing mobile money infrastructure, that being said, the CBDC without the need for mobile internet.

In comparison with the international guidelines mentioned in Chapter (4), it is observed that CBN explicitly mentioned the CBDC will adhere to the BIS's foundational principles and that eNaira coexists with the existing cash and monetary systems. Furthermore, the policy motivations for the eNaira are unique to the country's economic landscape;

- eNaira aims to increase financial inclusion in the country.<sup>10</sup>
- eNaira can reduce transaction costs of remittances from Nigerian migrants to their families.<sup>11</sup>
- eNaira can reduce the informality and abuse of the tax system within the economy as the CBDC can monitor the transactions and increase transparency.

It is observed that the design principles of the eNaira are explicitly based on the BIS's principles. CBN claimed that the eNaira will coexist with the cash while the central bank maintains and develops the CBDC platform to integrate into the existing financial inclusion initiatives. Before discussing the design principles and features of the eNaira, it is necessary to explain Nigeria's existing initiatives for financial inclusion. Nigeria hosts a significant amount of public/private FinTech solutions in the country as part of the Financial Inclusion Strategy, and the country has a vast agent banking network distributed across the country. These agents are not commercial banks from in material perspective but payment service providers (PSPs) representing the banks and other mobile money service providers, offering basic financial services such as depositing and withdrawals. In addition, Nigeria has the highest cellphone penetration network among the sub-Saharan countries with 87% of the

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<sup>9</sup> eNaira was launched in October 2021.

<sup>10</sup> Nigeria is one of the financially excluded countries that 36 percent of the adult population lack bank accounts (Ree, 2023).

<sup>11</sup> Central Bank of Nigeria (2021) claimed that Nigeria received \$24 billion remittances in 2019 ( 5.3% of GDP) with high fees (7.8-8.7% per transaction).

population having money phone and access to mobile money services. CBN's approach to designing the CBDC also aligns with the BIS's emphasis that the features and core system of the CBDC should fit with the country's unique economic structure.

According to the CBDC whitepaper (Central Bank of Nigeria, 2021), the eNaira adopts the Decentralised Ledger Technology (DLT), yet it is a pure account-based system. This approach also shares the same concepts with IMF's 5P methodology, in terms of collaborating with private institutions to develop the core infrastructure of the CBDC system.<sup>12</sup> Furthermore, eNaira offers both online and offline functionalities, but unlike many digital wallets, eNaira allows users to deposit and withdraw funds even without an internet connection by utilizing USSD codes for these transactions.<sup>13</sup> In that way, the eNaira is accessible to a wider user base and users are no longer required to have a smartphone and use the eNaira features through basic phones with sim cards. In addition, the eNaira also aligns with BIS's foundational principles that offer platform interoperability such as financial institutions can integrate their existing product and services into the eNaira platform or base on it to offer new services. On the other hand, the eNaira shares similarities with IMF's 5P methodology in that CBN has completed preparatory steps and a pilot project before officially launching the project. However, it is unconventional that the eNaira project adopted a phase-by-phase strategy, with the initial pilot phase in October 2021 and transitioning into the formal operational phase in August 2022. There was no distinct pause for a post-pilot evaluation before a broader public launch. Similar to most of the CBDC projects, eNaira also utilized a Routed Model where CBN designs and issues the eNaira and financial institutions distribute it to the end-users.

Finally, the eNaira wallet offers individual and merchant wallets in which each wallet contains several KYC requirements and transaction limits. It is observed that opening an individual basic account only requires a phone number which has a large potential to onboard

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<sup>12</sup> Bitt. Inc was selected as a private partner to develop the core infrastructure for the enaira (Central Bank of Nigeria, 2021).

<sup>13</sup> USSD (Unstructured Supplementary Service Data) codes are specific codes that is used to send text messages. It is available in both basic phones and smartphones to connect without a need for an internet connection for Voting, Polling, Ticketing and also for Mobile Payment.

unbanked people into the formal sector. According to Emeziele, the governor of CBN, the eNaira wallet users are exceeding 13 million, for a total money supply of 3 billion eNaira, and transaction value has reached 22 billion nairas (approximately \$48 million) in 2023 (Onu, 2023).

### **6.3 e-CNY**

People's Bank of China (PBoC) is one of the first central banks to start exploring their digital currency concept. PBoC launched the Digital Currency/Electronic Payment (DC/EP) project in 2014 which aimed to research the digital currency issuance, operating models, domestic and international interoperability, and the underlying infrastructure for the potential of e-CNY as a CBDC (People's Bank of China, 2021).

At first glance, it is observed that the guidelines of e-CNY have a similar structure as described in Chapter (4), PBoC explicitly mentioned that the principles of e-CNY will not harm the existing monetary landscape in the country. The e-CNY whitepaper outlines the motivations for developing digital currency and claims that

- e-CNY plans to offer a digital alternative to cash and promote financial inclusion
- e-CNY improves the E-commerce landscape in the country and inserts fair competition in the domestic payment landscape
- e-CNY explores its feasibility for cross-border payments.

As a brief background of the area, Song et al. (2020) asserts that, regardless of the financial development strategies of the government, the effectiveness of such differs in the regions, leaving the households in rural China to lack access to financial services. According to Demirgüç-Kunt et al (2018), it is observed that 19.5% of unbanked individuals in China claimed that financial institutions are too far away from where they live. On the other hand, Demirgüç-Kunt et al (2018) again highlight that mobile ownership and being unbanked do not correlate in China as 82% of unbanked individuals had a mobile phone but only 35% of them used a mobile phone for financial services. This has become a clear policy motivation for PBoC as the bank states that e-CNY will remove the requirement for a bank account and the public can utilize basic financial services via the CBDC wallet, in the meantime, improving accessibility to financial services. On the other hand, PBoC also aims to diversify the digital payment landscape in the country. Within the population group that has access to

financial services, mobile payments have become a dominant force; the value of mobile payments in China increased from 11.7 trillion RMB (approximately USD 1.9 trillion) in 2013 to a staggering 347.1 trillion RMB (roughly USD 51.8 trillion) by 2019 (Center for Strategic and International Studies, 2020). Yet the available payment options are limited in the country; where Alipay owns 55% of the market share followed by WeChat Pay which holds 38.8% (Slotta 2021). PBoC (2021, p.5) explicitly announced that e-CNY aims to “*support fair competition, efficiency, and safety of retail payment services*”, and that e-CNY will supplement the existing payment services as individuals can use the service as an alternative and will be accepted anywhere as the digital currency is a legal tender. Last but not least, the guideline principles of e-CNY do not explicitly highlight the currency’s role in cross-border payments. Yet, it is included in the policy motivation for issuing the CBDC.

Moving next, one can observe that the e-CNY shares the same concepts as in the IMF’s 5P methodology that PBoC concluded the proof of concept and prototype phase before launching the e-CNY pilot tests. However, the PBoC does not mention the target population segment that the CBDC aims for, yet the project covers a diverse range of users in China from individuals and merchants of different businesses.<sup>14</sup> People's Bank of China (PBoC) initiated the pilot programs for e-CNY in April 2020 with your initial cities; Shenzhen, Suzhou, Chengdu, and Xiong'an, followed by Shanghai, Hainan, Changsha, Xi'an, Qingdao, and Dalian in 2020 (Fullerton & Morgan, 2022)

It is observed that the e-CNY employs the “Routed Model” that Fan Yifei, deputy governor of PBoC announced in 2018 that the e-CNY will be distributed from the central bank via the intermediary banks<sup>15</sup> as in the users withdraw the e-CNY from the commercial banks and authorized institutions while the PBoC issues the e-CNY. The first tier includes the PBoC which oversees the issuance of the e-CNY, and the second-tier hosts banks and financial institutions which distribute the e-CNY to end users. Furthermore, PBoC emphasized the role of e-CNY as a coexistence to physical RMB (Cash) that the central bank clarified

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<sup>14</sup> PBoC does not disclose the target population and segment of the CBDC yet the goals and motivations of it revolve around promoting the financial inclusion and the payment infrastructure in the country.

<sup>15</sup> PBoC used the term two-tier operation model that PBoC manage the e-CNY centrally at the first tier and the authorised operators (commercial banks) at the second tier.



“neither stop supplying it nor replace it via administrative order” as long as public demand for cash persists” (People’s Bank of China, 2021, p. 4) Unlike Bahamas Sand Dollar and the Nigerian e-Naira, the PBoC established the 100% reserve requirement for commercial banks holding e-CNY upon its initial launch (Yeung, 2023). PBoC claimed that the reserve requirement is set up to prevent the over-issuance of money. In terms of the e-CNY distribution mechanism and interoperability, the PBoC primarily used the state-owned banks; China Construction Bank, the Industrial and Commercial Bank of China, Bank of China, Agricultural Bank of China, in which MYBank (Bank for AliPay) and WeBank (Bank for WeChatPay) joined the e-CNY trials.

It is also observed that the e-CNY accompanies different types of wallets depending on the transaction amount and anonymity levels so that individuals can access basic financial services such as small payments without official identification. In addition, the PBoC allows personal and corporate types of wallets and access methods (both software and hardware). These features will onboard most of the population and business to the formal financial sector as the access point to the CBDC is flexible for them. On the other hand, PBoC binds the e-CNY with a legal obligation as a legal tender that merchants are mandatory to accept the e-CNY unlike private digital payment options, e-CNY cannot be rejected for the users to make payments. Offline functionality also plays a big role in formalizing and encouraging the unbanked population to use their mobile phone as a payment platform.

It is observed that PBoC diverges from the IMF’s 5P methodology in that there are no private entities involved in the development of the core infrastructure. PBoC has characterized the e-CNY as an account-based payment system and a hybrid system that leverages both a centralized ledger for recording retail transactions and a distributed ledger technology (DLT) for reconciliation at the end of each day, in which it holds the sole authority to manage and monitor the transactions. However, on the other hand, PBoC encourages competition among the private intermediaries in that the commercial banks integrate their existing and new services into the e-CNY. Last but not least, PBoC announced that there are more than 250 million users with a money supply of 13.61 billion e-CNY (People’s Bank of China, 2022). Nonetheless, the current stage of e-CNY can be named the longest, yet largest CBDC pilot project conducted on a global scale where PBoC has not set a formal timetable for the official launch of its CBDC.

## 6.4 Summary

It is observed that case studies countries share similarities in policy motivation and operational frameworks. Especially, they all prioritize improving financial inclusion, thereby formalizing the informal economy by providing basic financial services through the CBDC platform. Countries use different blockchain systems, but they all are fully DLT or rather quasi-DLT in terms of core infrastructure for the CBDC. On the flip side, one can observe certain differences among the CBDC projects, for example;

- The Bahamas and Nigeria have unique challenges such as infrastructural limitations, geographical dispersion, and a high rate of existing financial exclusion while China has already established a digital payment infrastructure to readily integrate the CBDC.
- Sand Dollar and eNaira rather rely on mobile money infrastructure which has more coverage and penetration among the end-users while e-CNY primarily emphasizes distribution through state-owned banks.
- PBoC imposes 100% reserve requirements for the participating financial institutions while CBoB and CBN lift the reserve requirement.

On the other hand, one can observe unique features of each project that, the operational framework of Sand Dollar aims to improve accessibility in remote communities and onboard into the formal economy. eNaira fully utilized the added advantage of offline transactions via USSD codes, where e-CNY aims to create the common CBDC platform for all the existing digital payment systems in the country. A summarized table (Table 6.1) showing the parameters that reflect the case studies' CBDC landscape is provided in the following.

**Table 6.1: A summarized table showing the parameters of each project**

	<b>Sand Dollar</b>	<b>eNaira</b>	<b>e-CNY</b>
<b>Motivation and policy objectives for CBDC issuance</b>	Improve financial inclusion, onboard commercial activities into the formal economy and prevent illicit abuses of the financial system.	Increase financial inclusion, reduce transaction costs of remittances, reduce informality and abuse of tax system	Improve accessibility to financial services, diversify the digital payment landscape, and promote fair competition in the existing network
<b>Target Population</b>	Financially excluded individuals in remote communities	General population	Unbanked individuals, households in rural areas
<b>CBDC Architecture and Infrastructure</b>	DLT-based, tiered account/token-based system	DLT-based, account-based system	Hybrid system with centralized ledger for recording transactions and DLT for reconciliation
<b>Interoperability</b>	Coexists with fiat currency, interoperable with existing systems	Coexists with fiat currency, interoperable with existing systems	Coexists with fiat currency, interoperable with existing systems
<b>CBDC Product Features</b>	Basic Financial Services, offline functionality	Basic Financial Services, offline functionality	Basic Financial Services, offline functionality for both digital and physical means.
<b>CBDC economic profile</b>	Approximately one million Sand Dollars circulating with 110,000 users	13 million users, 3 Billion eNaira.	250 million users, money supply of 13.61 Billion e-CNY
<b>User Adoption and Profile</b>	Different wallet types for individuals and merchants, online/offline functionality, minimal KYC for low-value accounts	Individual and merchant wallets, accessible via USSD codes, with minimal KYC requirements	Various wallet types and access methods

Furthermore, with the help of CBDCs, if one sees from the institution-end to operability on the ground, it will reduce the costs to open and own a digital CBDC wallet (for example; time, document requirements, transaction cost, etc.), fulfill information to get access to financial services offered on the CBDC platform, and rather improve visibility and transparency for the financial institutions and the government.

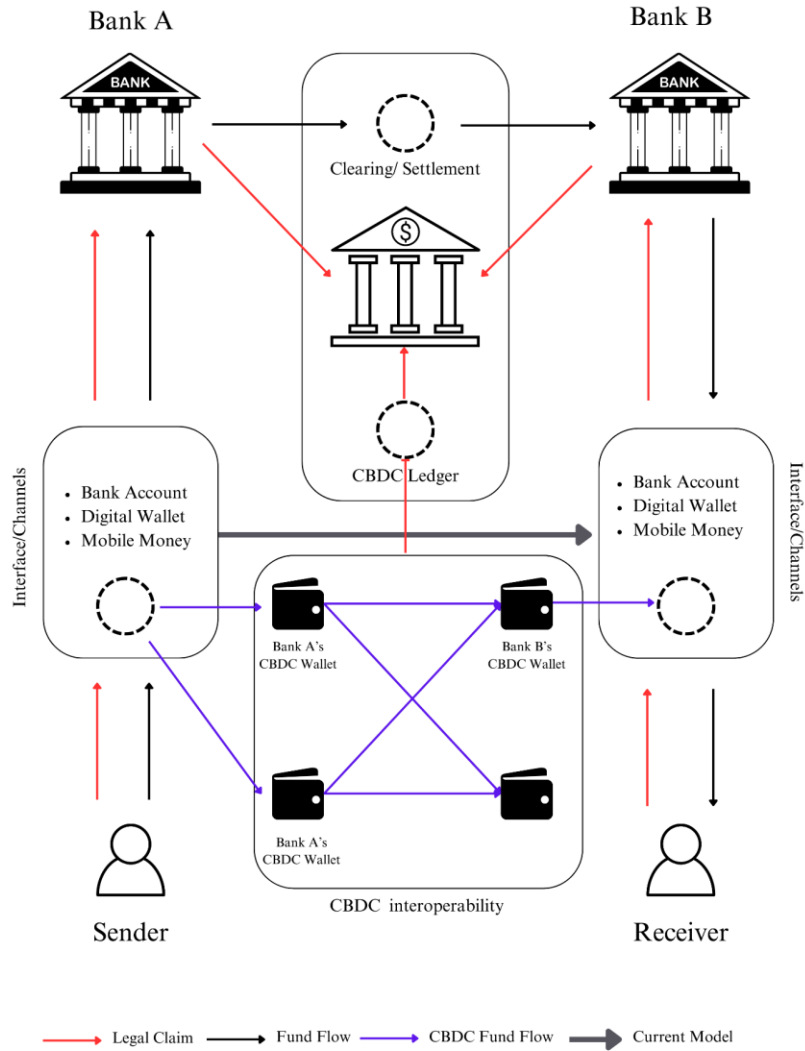
Based on the case studies, one can depict that CBDCs offer possibilities to bridge the gaps of financial inclusion and formalization. This is illustrated in the Figure (6.1). Based on the current model of interoperability between the two financial institutions, for one to send or receive the funds, he/she is required to own a bank account or at least somewhat of a financial interface, which requires to fulfill a ranging set of regulations, to enable the transactions. It is done instantly for the users based on the interface they see (a solid grey arrow), yet several functions are followed for the clearing and settlement processes. The CBDC system makes use of the current financial infrastructure (blue arrows). For example, those, who are already banked<sup>16</sup> may initiate transfers from either bank accounts or digital wallets to CBDC accounts to receive electronic funds, such as payroll deposits, or making payments. Those who are unbanked<sup>17</sup> would probably deposit money into their mobile money and transfer it to CBDC wallets. However, from the user-end, limits imposed on CBDC transactions and balances may refrain them to adopt the CBDC.

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<sup>16</sup> Including both individuals and firms

<sup>17</sup> Including both individuals and firms

**Figure 6.1: Transfer process of money in CBDC economy**



Source: Author's Elaboration

## **7. Conclusion**

This chapter will conclude the thesis by testing the hypothesis and answering the research questions. It will also state the research limitations and the future prospects of the research.

### **7.1 Hypothesis Testing**

Based on the analysis and case studies conducted for the thesis, it is found that “*Evaluating the launched Central Bank Digital Currency (CBDC) Projects against established international guidelines revealed varying degrees of effectiveness to bridging the formal-informal divide by enhancing financial inclusion within the informal economies of developing countries*” in the case of the Bahamas, Nigeria, and China. Therefore, it is consistent that the hypothesis is true and valid and offers an opinion that while not a singular solution, CBDCs can be a complementary solution for formalizing the informal economy through financial inclusion.

### **7.2 Mechanisms for Financial Inclusion**

CBDC adoption could bridge the informal economy into the formal sector in developing countries. However, it is not the sole factor of CBDC issuance but a combination of factors, paving the CBDC platform that fits the current state and designation of the economy. First of all, CBDC projects aim to offer basic financial services such as small deposits and payments through CBDC wallets, with the least requirements compared to the current mechanisms (as we observed in Nigeria and China). This feature directly targets the unbanked population lacking access to traditional banking systems, further onboarding them to the formal economy. Secondly, CBDCs can potentially reduce transaction costs (for example, CBDC is a digital version of cash to bypass the intermediaries and their associated fees) which turns out to be an incentive to transition to formal channels. Third, transactions on the CBDC platforms will increase transparency for both users and the government, in the meantime, discouraging illegal and informal activities via the platform. Last but not least, the interoperability of CBDCs can facilitate the onboarding of informal economy participants to the formal economy, like eNaira and e-CNY, that leverage the existing mobile money/digital wallet infrastructure.

It is observed that there is a positive relationship between CBDC adoption and access to financial services. This is because the foundational principles of the CBDC as such are primarily designed to target the unbanked population. For example, CBDCs can remove the traditional barriers to financial services, such as geographical distance, and account opening procedures. CBDCs with online/offline alternatives can bring financial services directly to users, regardless of their location. This is obvious, especially in Nigeria where the country's penetrative cellular network is used as a medium via the USSD codes for those who may lack consistent internet access.

Furthermore, as informal economy participants become part of the formal financial system through CBDCs, they might gain access to credit products in the future, for example, the backbone CBDC system such as e-CNY allows existing financial institutions to integrate their services into the CBDC platform. Accordingly, new saving and credit products could come from traditional financial institutions or microfinance lenders, which can use CBDC transaction data for creditworthiness assessments. However, the current CBDC wallets are incorporated with limitations on transaction amounts and balances, which could become a drawback for informal participants to save significant amounts as offered by commercial banks or use CBDCs for large credit transactions.

### **7.3 Limitations and Future Research Directions**

This research has three limitations. First of all, this research solely relied on content and document analysis to evaluate the international guidelines and case studies due to operational constraints to conduct field interviews on the ground. This equipped the thesis with valuable insights to understand the design and policy goals of the CBDC, yet it needs to fully capture the limitations on stakeholder engagement at different levels and CBDC implementation on the ground. Secondly, as CBDC projects are still in their early stages, there are no established datasets for the usage, impacts, and economic effects of the CBDCs. Finally, the research covers the insights from the delivery side of the institution-end, not the systemic side of the institution-end. As the main focus of the study is to understand the CBDC impacts on financial inclusion and formalization, the research did not cover the macroprudential perspectives such as the effect of either issuing the interest-bearing CBDC or not, and the banking regulations that will revolve around the CBDC issuance.

Needless to say, Central Bank Digital Currencies potentially complement the way finance is accessed and utilized. However, CBDCs are a new practice to hold and transfer digital money, similar to what is available in traditional systems but different in characteristics and principles. The CBDC system itself will not be sustainable if the users do not adopt and use this new money. Thus far, being aware of the limitations, this research also opens doors for future opportunities to explore. First, further studies could employ field studies, interviews, quantitative analysis, etc., to understand the user experience (for example, affordances, degree of anonymity, accessibility) of the CBDC and to examine the role of the central bank in communicating among the different levels of stakeholders and with the general public.

Furthermore, as if more CBDC guidelines will be introduced in the future, accompanied by national, and international projects, it is plausible to add more CBDC guidelines and frameworks to evaluate and compare the case studies. One could also incorporate additional academic concepts and disciplines (for example, blockchain, central banking, etc) to understand how the new money is designed, adopted, and accepted among the users. Finally, one could perform a comparative analysis between different national CBDCs if they are launched in the near future.



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## List of Appendices

### Appendix no. 1: BIS CBDC Foundational Principles and Core Features

	Description
<b><i>Foundation Principles</i></b>	
Do not Harm	CBDCs shouldn't disrupt existing monetary and financial stability. Users can use CBDC and Cash interchangeably.
Coexistence	CBDCs should coexist with existing forms of money (cash, bank accounts). Central banks should continue offering cash as long as there's demand.
Innovation and Efficiency	Innovation is needed to keep the payment system efficient and safe. Users shouldn't be forced to use unsafe alternatives. Both public and private sectors play a role in creating a safe and accessible payment system.
<b><i>Core Features</i></b>	
<b>Instrument Features</b>	
Convertible	CBDC should be equal to public and private money.
Convenient	Using the CBDC should be as convenient as cash (physical bills) or contactless payments (cards, phones).
Accepted and available	Minimal tech requirements for users and offline functionality
Low cost	CBDC should be available with low or no fees.
<b>System Features</b>	
Secure	High resistance to cyberattacks, counterfeiting
Instant	Instant or near-instant final settlement for transactions
Resilient	Function even during outages, disasters, with some offline capability.
Available	24/7/365 access for users
Throughput	CBDC core infrastructure able to handle large transaction volumes.
Scalable	Handle high transaction volumes and be expandable for future growth.
Interoperable	Integrate with existing private payment systems.
Flexible and Adaptable	Being flexible to adjust to changing conditions and policies.

<b>Institutional Features</b>	
Robust Legal framework	Clear central bank authority for CBDC issuance.
Standards	CBDC system and participants follow appropriate regulatory standards.

Source: Bank for International Settlements. (2020).

## Appendix no. 2: IMF 5P Methodology

<b>Phases</b>	<b>Parameters</b>
<b>Preparation</b>	Research emerging technology and their functionalities to understand the options of available CBDC architecture and their tradeoffs. Identify potential tech issues and resources needed for each development phase.
<b>Proof-of-concepts</b>	Test different design elements and potential CBDC architectures that fits with the given economic conditions. Research the technologies that can support the implementation of the produced CBDC concepts
<b>Prototypes</b>	Ensure the integration between key architectural components of the chosen operation/infrastructure option. Identify the skills and personnel needed to build and maintain the CBDC platform.
<b>Pilots</b>	Verifying the tested system's functionality and risk mitigation strategies under the real-world conditions, followed by maintenance, and evaluating the operating procedures to keep the system running.
<b>Production</b>	Prioritizing the strategies to promote adoption and manage the potential risks, integrating/monitoring new technology into the CBDC, obtaining the operational stability and security.

Source: Tourpe et al. (2023), Soderberg et al. (2023)