

# Financial Innovation through CBDC – A New Era of Digital Payments in India

Ms. Sumathi<sup>1</sup>, Mr. Prashanth Kumar A<sup>2</sup>, Mr. Sudheesha Poojary<sup>3</sup>

<sup>1</sup>Asst. Professor, SDM PG Centre, Mangalore, Karnataka

<sup>2</sup>Asst. Professor, SDM PG Centre, Mangalore, Karnataka

<sup>3</sup>Principal, Shree Devi College, Mangalore, Karnataka

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## ABSTRACT

India, in the recent few years has witnessed a revolution in the field of payment system through innovative digital business models. Banks in India are collaborating with third-party providers to boost innovation in the payment ecosystem. Technology is evidently evolving in parallel with the end user, and use cases are increasing with the emergence of new avenues of payments. Payments form the core of any financial institution and it's becoming imperative for central banks to provide avenues that offer new world functionalities for relevance. Central Bank Digital Currency (CBDC) is one such avenue that aims to help central banks facilitate financial services widely. The Government of India announced the launch of the Digital Rupee — a Central Bank Digital Currency (CBDC) from Financial Year 2022-23 onwards. The RBI foresees e-Rupee, an Indian CBDC as the next-generation payment mode that is seamless, ubiquitous and anonymous, delivering customers value and a satisfying experience.

The present study attempts to bring out the conceptual framework of Indian CBDC and the future of digital payment system that would provide the country a boost towards growing as an economically strong nation in the world.

**Key words:** payment ecosystem, innovation, Digital Currency, ubiquitous, experience, boost

## I. INTRODUCTION

The present payment systems prevailing in India, which are affordable, accessible, convenient, efficient, safe, secure, are a matter of pride for the entire nation. Just as in many cases, India is far ahead of the most developed countries, it has also made impressive progress towards innovation in digital payments by enacting a separate law for Payment and Settlement Systems, which has

enabled an orderly development of the payment eco-system in the country.

This striking transformation in payment preference has been majorly due to the creation of robust electronic payment systems such as Real Time Gross Settlement (RTGS) and National Electronic Funds Transfer (NEFT) that have facilitated coherent real-time fund transfers. Additionally, the launch of Immediate Payment Service (IMPS) and Unified Payments Interface (UPI) for instant payment settlement, and the introduction of mobile-based payment systems such as Bharat Bill Payment System (BBPS), and National Electronic Toll Collection (NETC) to facilitate electronic payments have been the kairotic moments which transformed the payments ecosystem of the country and attracted international recognition. Central bank digital currencies (CBDCs) represent another such potential innovation.

## Objectives of the Study:

- To understand the basic concepts of CBDC system in India.
- To know the transformation that Indian CBDC has brought in the payment system.
- To evaluate the future challenges of payment system in India.

## What is CBDC?

A central bank digital currency (CBDC) is a form of digital currency issued by a country's central bank. It is similar to cryptocurrencies, except that its value is fixed by the central bank and is equivalent to the country's fiat currency.

## Definition of CBDC

Reserve Bank of India broadly defines CBDC as the legal tender issued by a central bank in a digital form. It is similar to sovereign paper currency but takes a different form, exchangeable

at par with the existing currency and shall be accepted as a medium of payment, legal tender and a safe store of value.

CBDC is a digital or virtual currency but it is not comparable to the private virtual currencies that have mushroomed over the last decade. Private virtual currencies sit at substantial odds to the historical concept of money, which are not commodities or claims on commodities as they have no intrinsic value.

### The money flower

The money flower focuses on the combinations of four key properties:

- Issuer(central bank or other)
- Form(digital or physical)
- Accessibility(widely or restricted)
- Technology(token- or account-based).

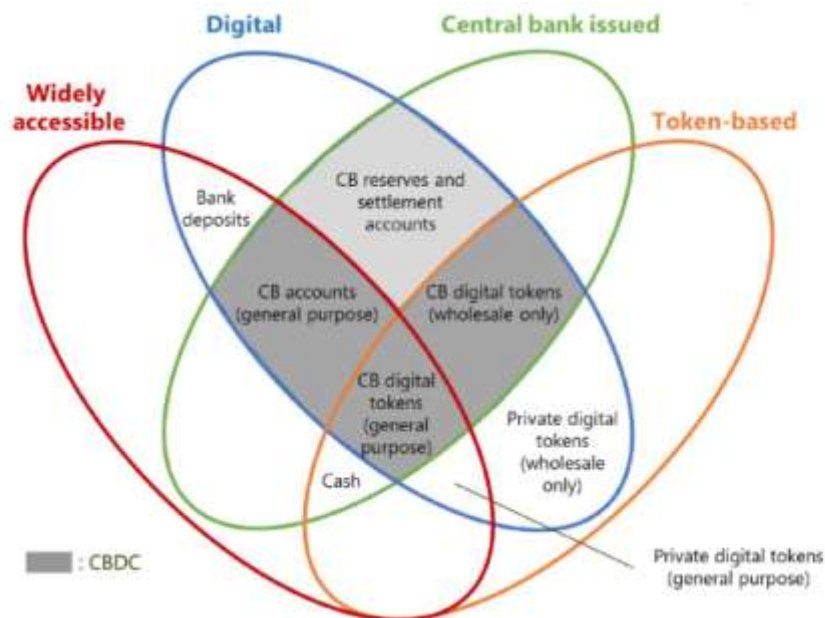


Fig. No. 1

### Design features

- **Availability:** Currently, access to digital central bank money is limited to central bank operating hours, traditionally less than 24 hours a day and usually five days a week. CBDCs could be available 24 hours a day and seven days a week or only during certain specified times (such as the operating hours of large-value payment systems).
- **Anonymity:** Token-based CBDC can, in principle, be designed to provide different degrees of anonymity in a way that is similar to private digital tokens. A key decision for society is the degree of anonymity with regard to the central bank, balancing, among other things, concerns relating to money laundering, financing of terrorism and privacy.
- **Transfer mechanism:** The transfer of cash is conducted on a peer-to-peer basis, while central bank deposits are transferred through the central bank, which acts as an intermediary. CBDC may be transferred either on a peer-to-

peer basis or through an intermediary, which could be the central bank, a commercial bank or a third-party agent.

- **Interest-bearing:** As with other forms of digital central bank liabilities, it is technically feasible to pay interest (positive or negative) on both token- and account-based CBDCs. The interest rate on CBDC can be set equal to an existing policy rate or be set at a different level to either encourage or discourage demand for CBDC.<sup>11</sup> Both non-interest bearing and interest bearing accounts could be used for retail or wholesale payment transactions. The payment of (positive) interest would likely enhance the attractiveness of an instrument that also serves as a store of value.
- **Limits or caps:** Different forms of quantitative limits or caps on the use or holdings of CBDC are often mentioned as a way of controlling potentially undesirable implications or to steer usage in a certain direction. For example, limits or caps could make a CBDC less useful

for wholesale rather than retail payments. At present, such limits or caps on holdings/use are most easily envisioned in non-anonymous account-based systems

Money is typically based on one of two basic technologies, namely tokens of stored value or accounts. Cash and many digital currencies are token-based, whereas balances in reserve accounts and most forms of commercial bank money are account-based.

A notable distinction between token-based and account-based money is the form of verification needed when it is exchanged. Token-based money rely critically on the ability of the payee to verify the validity of the payment object. With cash, the worry is counterfeiting, while in the digital world the worry is whether the token or “coin” is genuine or not (electronic counterfeiting) and whether it has already been spent.

By contrast, systems based on account money depend fundamentally on the ability to verify the identity of the account holder. A key concern is identity theft, which allows perpetrators to transfer or withdraw money from accounts without permission. Identification is needed to correctly link payers and payees and to ascertain their respective account histories.

### Purposes of CBDCs

It is very shocking to know that in the U.S. and many other countries, many individuals donot have access to financial services. In the U.S. alone, 6% of adults had no bank account in 2023. In many other countries, the numbers are much higher. With that in mind, the main purposes of CBDCs are:

- To provide businesses and consumers conducting financial transactions with privacy, transferability, convenience, accessibility, and financial security.
- To decrease the cost of maintenance that a complex financial system requires, reduce cross-border transaction costs, and provide those who currently use alternative money-transfer methods with lower-cost options.
- To reduce the risks of using digital currencies, or cryptocurrencies, in their current form.
- To provide a country's central bank with the means to implement monetary policies to ensure stability, control growth, and influence inflation.

### Types of CBDC

There are two types of CBDCs: wholesale and retail. Wholesale CBDC (e□-W) is designed for restricted access to selected financial institutions while, Retail CBDC (e□-R) is an electronic version of cash, which would be potentially available for use by all, namely, private sector, non-financial consumers and businesses.

**Table No. 1**

Retail CBDC Vs Wholesale CBDC	
<ul style="list-style-type: none"> <li>• Would be potentially available for use by all, namely, private sector, non-financial consumers and businesses.</li> </ul>	<ul style="list-style-type: none"> <li>• Designed for restricted access to selected financial institutions</li> </ul>
<ul style="list-style-type: none"> <li>• Electronic version of cash primarily meant for retail transactions.</li> </ul>	<ul style="list-style-type: none"> <li>• Intended for the settlement of interbank transfers and related wholesale transactions.</li> </ul>
<ul style="list-style-type: none"> <li>• Can provide access to safe money for payment and settlement as it is a direct liability of the central bank.</li> </ul>	<ul style="list-style-type: none"> <li>• Has the potential to transform settlement system for financial transactions and make them more efficient and secure.</li> </ul>

### Recent Developments

- **The first pilot in the Digital Rupee - Wholesale segment (e□-W)** commenced on November 1, 2022. The system methodology for this pilot is the settlement of secondary market transactions in government securities with the expectations to make the interbank market more efficient. Settlement in central

bank money leads to reduction in transaction costs by pre-empting the need for settlement guarantee infrastructure or for collateral to mitigate settlement risk. The Reserve Bank of India identified nine banks for participation in the Digital Rupee’s wholesale pilot project, which include State Bank of India, Bank of Baroda, Union Bank of India, HDFC Bank,

ICICI Bank, Kotak Mahindra Bank, Yes Bank, IDFC First Bank and HSB.

- The RBI announced the launch of **the first pilot for retail digital Rupee (e₹-R)** on December 01, 2022. The pilot covered select locations in Closed User Group (CUG) comprising participating customers and merchants. The e₹-R, in the form of a digital token that represents legal tender was issued in the same denominations that paper currency and coins are currently issued. Users are able to transact with e₹-R through a digital wallet offered by the participating banks and stored on mobile phones/devices. Transactions can be both Person to Person (P2P) and Person to Merchant (P2M). Payments to merchants can be made using QR codes displayed at merchant locations. It also offers the features of physical cash like trust, safety and settlement finality. As in the case of cash, it does not earn any interest and can be converted to other forms of money, like deposits with banks.

Eight banks were been identified for phase-wise participation in this pilot. The first phase began with four banks, viz., State Bank of India, ICICI Bank, Yes Bank and IDFC First Bank in four cities across the country. Four more banks, viz., Bank of Baroda, Union Bank of India, HDFC Bank and Kotak Mahindra Bank joined this pilot subsequently. The pilot initially covered four cities, viz., Mumbai, New Delhi, Bengaluru and Bhubaneswar and later extended to Ahmedabad, Gangtok, Guwahati, Hyderabad, Indore, Kochi, Lucknow, Patna and Shimla.

### Functions and role considerations of the end-to-end CBDC framework

#### Core system

- **Core rulebook:** The RBI is the apex body for defining the principles of CBDC usage, outlining the legal basis, governance, risk management and access requirements for participants.
- **Core infrastructure:** Issuing and redeeming CBDC is a core central bank function with certain technical aspects outsourced to third-party vendors.

#### Broader ecosystem

- **Processing infrastructure:** The open infrastructure at the payment layer is facilitated by APIs between commercial bank participants to aid in message preparation, processing and reconciliation.

- **Processing services:** Banks run the following functions which are inherent to guiding transactions from initiation to completion: (a) limit check and fund availability, (b) authorisation, verification and validation, and (c) screening. The following services are provided by banks through payment applications: (a) pre-transaction – channel access and onboarding of users, (b) execution – payment instruction and authentication, and (c) post-transaction – advice statements and confirmations.
- **Use case arrangements:** Technical and business rules on how a use case should flow within an application are determined by the bank maintaining the CBDC application.

### Potential challenges with implementation

Some of the major challenges related to the implementation of CBDC are:

#### Ensuring consumer privacy and wallet security

- The governance policy should make up for the lack of personal data protection regulations and be flexible enough to adapt to the dynamic socio-economic system.
- Robust data security systems and stringent data access rules such as multi-level protection strategies and advanced intrusion detection systems must be examined before implementation to prevent any cyberattacks and breaches.
- Absolute anonymity may fuel money laundering and terrorist financing activities. Hence, defining the right regulatory framework with restrictions and gatekeeping conditions is a must.

#### System scalability

- DLT-based implementations are faced with potential scalability issues and performance concerns; proper research must be done on permissioned DLT to counter these concerns.
- Ensuring consistent transaction processing across all channels is paramount and hence correct execution of transactions is necessary even in the case of unforeseen events.
- Precise estimation of volume of users and transactions is key to evaluating multi-server computing systems and data syncing needs for performance.

#### Data management and retention

- The KYC process should have stringent data processing and controls in place that make payment data accessible to end users and intermediaries only.

- Data management for anonymous low-value transactions and large value transactions can be challenging, but the challenges can be mitigated by implementing identifiers or hashcodes.
- Absolute anonymity within transactions will offer little insight into the movement of CBDCs and payment trends. Hence, striking a balance between data utilisation and consumer privacy is key to designing the right data model.

### Future roadmap

India is one of the largest economies in the world with a large and diverse population, so there are varied expectations from the CBDC pilot with several use cases and business models expected to emerge as the ecosystem scales up. Future use cases and key considerations related to the CBDC ecosystem are outlined below:

**Retail cross-border remittances:** A retail CBDC can help reduce the cost and increase the speed and reliability of remittances, especially for migrant workers who send money back to their families in India.

**Microfinance:** R-CBDCs can help support microfinance activities such as small loans and savings by providing a secure and accessible digital platform that embeds features like programmability and supports alternative underwriting models, digital onboarding, documentation, etc.

**Programmability:** The programmability of CBDCs can streamline direct disbursement, thereby widening financial inclusion.

**Offline payments:** Enabling payments in the offline mode is imperative for reaching the last layer. Given that CBDCs represent tokens, they are suited to offline transactions.

### Impact of CBDC on global trade

- The impact of an Indian CBDC on global trade would depend on a variety of factors, including the adoption rate of the Indian CBDC, the functionality and features of the CBDC, and the overall state of India's economy and trade relations with the world. Geopolitical situation and the willingness of at least the BRICS countries to move away from US dollars as the primary instrument for global trade, there could be widespread adoption of an Indian CBDC. If that happens, it could have several benefits for India's global trade. For one, it could make cross-border transactions faster, cheaper and more secure, potentially increasing the efficiency of global trade with India. Additionally, an Indian CBDC could help reduce currency exchange risks and costs for international buyers and

sellers, making Indian goods and services more attractive in the global market.

- However, the impact of an Indian CBDC on global trade could also be influenced by external factors, such as the stance of other countries on CBDCs and the overall global economic climate. For example, if other major trading partners of India do not adopt CBDCs, the benefits of an Indian CBDC may be limited. Additionally, if the global economy is experiencing a downturn, the impact of an Indian CBDC on trade may be mitigated.

- There could even be technological limitations with respect to the integration of the country's CBDC networks given that there is no single standard of implementation and various technologies are being adopted by other countries.

- Overall, it is difficult to predict the exact impact of an Indian CBDC on global trade till such time that there is more information available on the broader economic conditions at play.

## II. CONCLUSION

The rollout of CBDC or e-Rupee is a giant leap in India's digital transformation efforts. If the potential challenges in its implementation are addressed, CBDC could increase ease of doing business by overcoming geographical barriers. Cash usage has declined, paving the way for the emergence of alternative payment currencies and modes that are mostly decentralised. In this context, CBDC can ensure financial and environmental stability and financial inclusion, and catalyse innovation.

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