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Research Paper

Digital Rupee: Conceptualization of Newer Form of Currency in India

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ABSTRACT

The technology has brought on an uninterrupted wave of transformation in the payments industry especially in emerging economies such as India. In fact, in lines with the other developed nations, the Reserve Bank of India has made an announcement to launch the Central Bank Digital Currency (CBDC) which will serve a legal tender at par with the physical currency. Digital Rupee, officially the CBDC of India, which is not intended to replace the physical cash for payment purposes, is merely a substitute for many unsafe digital assets viz. cryptocurrencies and a facilitator for digital payments transformation. This paper gives a glimpse of the current status of CBDC across different countries of the world. Along with it, the types and proposed structure of CBDC has been discussed in detail in this paper. Finally, some merits and demerits pertaining to the digital currency have been mentioned in the paper along with an appropriate future perspective on it.

Keywords: *Digital Currency, Digital Rupee, CBDC, Cryptocurrency, Retail-CBDC, Wholesale-CBDC*

The history of money is fascinating and goes back thousands of years. From the early days of bartering to the first metal coins and eventually the first paper money, it has always had an important impact on the way we function as a society. The innovations in money and finance go hand in hand with the shifts in monetary history. In its evolution till date, currency has taken several different forms. It has traversed its path from barter, to valuable metal coins made up of bronze and copper which later evolved to be made up of silver and gold. Use of coins was a huge milestone in the history of money because they were one of the first currencies that allowed people to pay by count (number of coins) rather than weight. Somewhere along the way, people improvised by using claims on goods and a bill of exchange (RBI, 2022).

In her budget speech on February 1, 2022, Finance Minister Nirmala Sitharaman announced the Indian government's commitment to issuing a digital rupee. The relevant text was short and sweet, running three sentences in its entirety. "Introduction of Central Bank Digital Currency (CBDC) will give a big boost to digital economy. Digital currency will also lead to a more efficient and cheaper currency management system. It is, therefore, proposed to introduce Digital Rupee, using blockchain and other technologies, to be issued by the

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Reserve Bank of India starting in 2022-23." (Eichengreen et. al., 2022) With this proposal, India joined a long list of countries actively contemplating issuance of a CBDC.

With the developments in the economy and the evolution of the payments system, the form and functions of money has changed over time, and it will continue to influence the future course of currency. The concept of money has experienced evolution from Commodity to Metallic Currency to Paper Currency to Digital Currency. The changing features of money are defining new financial landscape of the economy. Further, with the advent of cutting-edge technologies, digitalization of money is the next milestone in the monetary history. Advancement in technology has made it possible for the development of new form of money viz. Central Bank Digital Currencies (CBDCs). Recent innovations in technology-based payments solutions have led central banks around the globe to explore the potential benefits and risks of issuing a CBDC so as to maintain the continuum with the current trend in innovations.

A 2021 survey by the Bank for International Settlements found that 86% of central banks were researching issues around CBDCs, that 60 % were experimenting with the technology, and that 14 % were in the process of deploying pilot projects. More than 80% central banks of the world have been examining the prospects of introduction of central bank digital currency with the help of implementing projects. Peoples Bank of China had launched digital yuan in Luohu district of Shenzhen in October 2020 and in Suzhou city in 2021.In Sweden, e-krona was introduced as central bank digital currency in 2020 as a pilot project. Bahama introduced sand dollar as CBDC in October 2020 using in two districts namely Exuma and Abaco as pilot project pegging with US Dollar at 1:1. Eastern Caribbean Central Bank started to introduce D Cash as pilot projects in Antigua and Barbuda, Grenada, Saint Christopher (St Kitts) and Nevis and Saint Lucia in Eastern Caribbean Currency Union. Kenya has introduced M- Pesa as its CBDC and Ecuador has introduced CBDC as trail run. The Bank of England, Central Bank of Canada, European Central Bank have initiated to launch the central bank digital currency. Even, Federal Reserve Bank of USA showed keen eagerness to introduce digital dollar to face the catapulting impact of cryptocurrencies in the world. (Bhowmik, January, 2021)

RBI has also been exploring the pros and cons of introduction of CBDCs for some time and is currently engaged in working towards a phased implementation strategy, going step by step through various stages of pilots followed by the final launch, and simultaneously examining use cases for the issuance of its own CBDC (Digital Rupee (e₹)), with minimal or no disruption to the financial system. Currently, we are at the forefront of a watershed movement in the evolution of currency that will decisively change the very nature of money and its functions (RBI,2022).

Bank for International Settlement has laid down "foundational principles" and "core features" of a CBDC, to guide exploration and support public policy objectives, as per the need of existing mandate of Central Banks. The foundational principles emphasize that, authorities would first need to be confident that issuance would not compromise monetary or financial stability and that a CBDC could coexist with and complement existing forms of money, promoting innovation and efficiency.

CBDC can be classified into two broad types viz. general purpose or retail (CBDC-R) and wholesale (CBDC-W). Retail CBDC would be potentially available for use by all viz. private sector, non-financial, consumers and businesses while wholesale CBDC is designed

for restricted access to select financial institutions. CBDC can be structured as 'token-based' or 'account-based'. A token-based CBDC is a bearer instrument like banknotes, meaning whosoever holds the tokens at a given point in time would be presumed to own them. In contrast, an account-based system would require maintenance of record of balances and transactions of all holders of the CBDC and indicate the ownership of the monetary balances. Considering the features offered by both the forms of CBDCs, a token-based CBDC is viewed as a preferred mode for CBDC-R as it would be closer to physical cash, while account-based CBDC may be considered for CBDC-W.

This introduction was meant to give the readers a background related to the topic under study. The rest of the paper contains a detailed review of the literature available on the topic, along with an analysis of current status of CBDC around the globe. Eventually, this paper discusses the types, structure and proposed models for introduction of CBDC in India. Several motivations and possible challenges for adoption of CBDC as a digital payment option have also been briefed about in this paper. Finally, this study concludes by mentioning the future prospects regarding introduction of CBDC in India.

REVIEW OF LITERATURE

As per Atlantic Council's CBDC Tracker report, 2022, the motivation of different countries for issuing CBDCs depends on their economic situation. However, some common motivations include promoting financial inclusion by providing easy and safer access to money for unbanked and underbanked populations, introducing competition and resilience in the domestic payments market, which might need incentives to provide cheaper and better access to money, increasing efficiency in payments and lowering transaction costs, creating programmable money and improving transparency in money flows and providing for the seamless and easy flow of monetary and fiscal policy. However, there are several challenges which one country might need to consider before launch of CBDC like banks might fall short of money to lend if the citizens pull too much money out of banks at once by purchasing CBDCs. Besides, CBDCs require a complex regulatory framework including privacy, consumer-protection, and anti-money laundering standards which need to be made more robust before adopting this technology.

Kumari Meena (2021) analyzed critically that for success of CBDC in India, robust technology and secure environment are key elements as CBDC has a potential to become largest digital transactions platform in any country so challenges related to cyber threats may become manifold more than any existing digital transactions platform in the country. Besides, Kumari Meena (2021) also upheld that the rewards of CBDC for users include case of storage and transactions, privacy and security, bank account in pocket without financial intermediary and easy access to benefits and subsidy.

Farooqui (2022) in the article "Digital Currencies-an unsecure and unclear window, need to regulate or to ban in India" contends against the launch of digital currency as she believes that computerized monetary forms or digital currencies have been exposed to allegations of estimating bubbles key to the trilemmas that exists between regulatory oversight, the potential for illegal use through its obscurity inside a youthful immature trade framework, and infrastructural breaks affected by the development of digital guiltiness. Moreover, it has been contended that macroeconomic and microeconomic contemplations have to be well-considered for successful implementation of CBDC across the entire economy.

Samudrala et. al. (2021) asserted that interoperability is critical for successful adaptation and hence, form of money needs to be separated from payment rails in CBDC design. Moreover, it has been asserted that Greenfield CBDC payment rails can be very expensive to build and onboard and hence, CBDC must leverage existing investments in payment modernization. India can be the thought leader and develop a purpose built CBDC solution, that can serve as model for other central banks in this journey. Risk and challenges associated with the launch of CBDC include financial stability credit growth, payments modernization and customer experience which must be considered before the launch of CBDC as per this study.

Babu and Abraham (2021) in their study "Central Bank Digital Currencies-policy and operational perspectives in India" found that due to rising hype of cryptocurrencies, most central banks, considering the risk associated with cryptocurrencies have veered towards Central Bank Digital Currency or "Digital Fiat" that shares several advantages of cryptocurrencies but are entirely mandated and managed by the central bank. A comprehensive background to CBDC and certain policy and operational aspects that an Indian CBDC launch should consider have also been discussed in the afore-mentioned study.

Kumar and Gochhait (2020), in their bibliometric analysis analysed the current scenario and brought on some possible ways to commercialize digital currency in the country like India which will change the perceptions of people about the digital currency, also to be the future currency of the world. However, from this analysis, it was observed that there was a reclining trend among people towards this form of virtual currency.

BIS Report (2021) in its article "Central Bank Digital Currencies: user needs and adoption" outlines that akin to past payment innovation, consideration of the features most valued by users, investigating incentives for adoption and carrying out consultations could all play an important role in CBDC design. Besides it, the continuous research on the impact on user requirements and financial stability safeguards on system design and the range of approaches to public engagement and consultation of CBDC is required.

CURRENT STATUS OF CBDC ACROSS THE GLOBE-

The Atlantic Council's state-of-the-art central bank digital currency (CBDC) Tracker, originally launched in April, 2020 has been used by the Federal Reserve, the Bank of International Settlements and news outlets across the world to help understand the decision countries are making in this rapidly advancing space. Following are some of the latest findings on the adoption of digital currencies:

- 105 countries, representing over 95 percent of global GDP, are exploring a CBDC. In May, 2020, only 35 countries were considering a CBDC. A new high of 50 countries are in an advanced phase of exploration (be it development, pilot or launch).
- 10 countries have fully launched a digital currency with China's pilot set to expand in 2023. Bahamas was the first country to launch its CBDC on a wider level, Jamaica being the latest country to launch a CBDC, the JAM-DEX. Nigeria, Africa's largest economy, launched its CBDC in October, 2021.
- Many countries are exploring alternative international payment systems. The trend is likely to accelerate following financial sanctions on Russia. There are 9 cross-border wholesale (bank-to-bank) CBDC tests and 3 cross-border retail projects.

- Of the G7 economies, the USA and UK are the furthest behind on CBDC development. The European Central Bank has signaled, it will aim to deliver a digital Euro by 2025.
- 19 of the G20 countries are exploring a CBDC, with 16 already in development or pilot stage. This includes South Korea, Japan, India and Russia. Each has made significant progress over past six months.
- The financial system may face a significant interoperability problem in the near future. The proliferation of different CBDC models is creating new urgency for international standard settings.

DIGITAL RUPEE- THE CBDC OF INDIA

The Reserve Bank of India is planning to launch its digital currency i.e. digital rupee in the form of digital currency in 2022-23. The digital rupee is the electronic form of physical cash. This status of this currency is similar to that of fiat currency. It is going to be one step forward towards the transformation of Indian economy into a digital economy. It is likely to enable and facilitate even larger foreign trade with the other countries. The digital rupee is going to be based on Distributed Ledger Technology (DLT) i.e. Blockchain Technology. However, the introduction of digital rupee is a safer form of carrying out transactions in the digital assets as compared to the cryptocurrencies because it is governed by the RBI. The Digital Rupee will withstand unfavorable market conditions even during unusual times like the pandemic (Economic Times, 2022; CNBC, 2022; Economic Times, 2022)

V. TYPES OF CBDC

1. RETAIL CBDC (CBDC-R): CBDC-R is potentially available for use by all private sector, non-financial consumers and businesses. CBDC-R is an electronic version of cash primarily meant for retail consumption. CBDC-R could also be explored for the following:

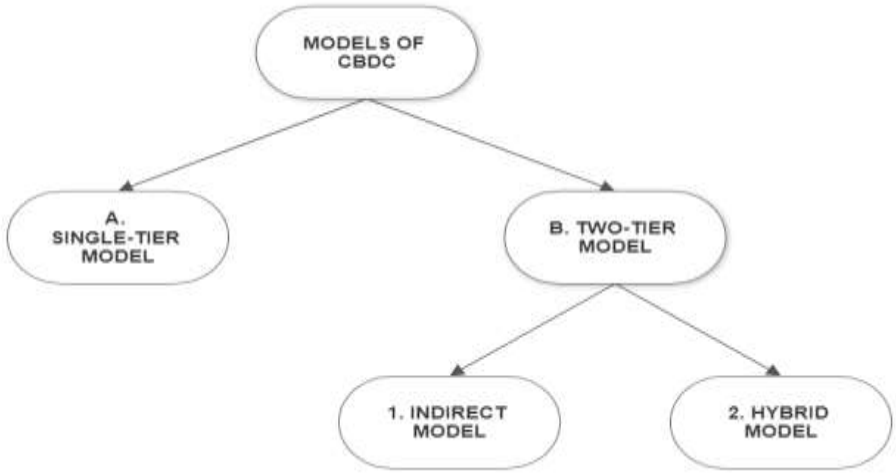
- Central banks interested in addressing financial inclusion are expected to consider using CBDC-R.
- India is already having a sound payment system with a different array of payment products ranging from RTGS, NEFT to UPI etc. coupled with an exponential increase in digital transactions. The introduction of CBDC-R will provide a safe, central bank instrument with direct access to the central bank money for payment and settlement.
- It is also argued that it could also reinforce the resilience of a country's retail payment systems.
- CBDC can provide an alternative medium of making digital payments in case of operational and/or technical problems leading to disruption in other payment system infrastructures.
- CBDC could reduce the concentration of liquidity and credit risk in payment systems (Dyson and Hodgson, 2016).

2. WHOLESALE CBDC (CBDC-W): CBDC-W is designed for restricted access by financial institutions. CBDC-W could be used for improving the efficiency of interbank payments or securities settlement, as seen in Project Jasper (Canada) and Ubin (Singapore). CBDC-W could further lend several benefits to the country's international payment infrastructure:

- CBDC-W has the potential to transform the settlement systems for financial transactions undertaken by banks in the G-sec segment, Inter-bank market and capital market more efficient and secure in terms of operational costs, use of collateral and liquidity management.
- This would also provide coincident benefits such as avoidance of settlement guarantee infrastructure or the need for collateral to mitigate settlement risk.
- The payment made with CBDC-W would stand complete only if a broad variety of conditional payment instructions, going far beyond today's delivery-versus-payment mechanism in real-time gross settlement (RTGS) systems are satisfied.
- CBDC-W could make central bank money programmable, to support automation and mitigate risks.
- The clean-state approach based on new technology stacks would let CBDC-W systems to be designed with international standards in mind to support interoperability.

PROPOSED MODELS FOR INTRODUCTION OF CBDC IN INDIA

This section of the paper takes into consideration various models available for the sake of issuance of CBDC across the globe. First of all, the different aspects of the three models available in the world will be compared and then, a model suitable to the requirements of India will be discussed in detail-



Available Models for Issuance and Management of CBDC

ASPECT	DIRECT	INDIRECT	HYBRID
LIABILITY	Central Bank	Central Bank	Central Bank
ISSUER	Central Bank	Central Bank issues and intermediaries distribute it.	Central Bank Issues and Intermediaries distribute it for retail use.
OPERATIONS	Central Bank	Intermediaries	Intermediaries
LEDGER	Central Bank	Intermediaries	Intermediaries as well as Central Bank
SETTLEMENT FINALITY	Yes	No	Yes

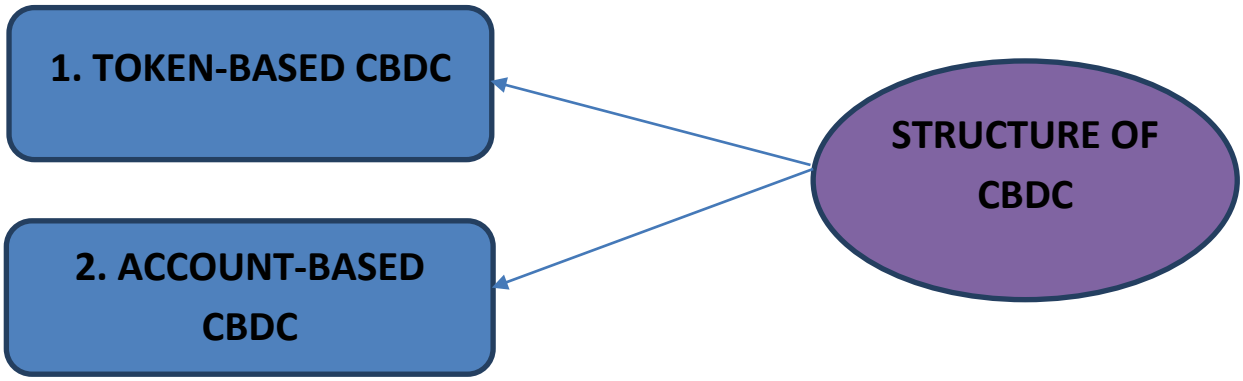
(Source: RBI Internal)

Considering the merits of different models, the Indirect system may be the most suitable architecture for introduction of CBDC in India. As per the RBI Act, 1934, the Reserve Bank has the sole right to issue bank notes, which has now been amended to include currency in digital form also. Therefore, in this model, RBI will create and issue tokens to authorised entities called Token Service Providers (TSPs) who in turn will distribute these to end-users who take part in retail transactions. The rationale behind the same are as given below:

i. In the entire supply chain, there are a wide range of customer-facing activities where the central bank is unlikely to have a comparative and competitive advantage as compared to banks, especially in an environment where technology is changing rapidly, which inter-alia includes distribution of CBDCs to public, account-keeping services, customer verification such as KYC and adherence to AML/CFT checks, transactions verification, etc.
ii. Banks and other such entities have the expertise and experience to provide these services.
iii. These entities can provide their customers with the ability to transact in and out of CBDC and thus can enrich the customer experience and may facilitate wider adoption of CBDCs.

STRUCTURE OF CBDC-

CBDC can be structured as 'token' or 'account' based or a combination of both.



1. **TOKEN-BASED CBDC-** A token-based CBDC system would involve a type of digital token issued by a representing a claim on the central bank and could effectively function as the digital equivalent of a banknote that could be transferred electronically from one holder to another. A token CBDC is a "bearer-instrument" like banknotes, meaning that whoever 'holds' the tokens at a given point in time would be presumed to own them. In a token-based system, the entire chain of ownership of every token must be stored in an encrypted ledger. Token-based CBDC can be mainly issued for retail purpose. Under a token-based CBDC-R regime, users would be able to withdraw digital tokens from banks in the same way they can withdraw cash.
2. **ACCOUNT-BASED CBDC-** An account-based CBDC requires the keeping of a record of balances and transactions of all holders of the CBDC and indicate the ownership of the monetary balances. Transactions in account-based system involves transferring CBDC balances from one account to another and depends on the ability to verify that a payer had the authority to use the account and that they had a sufficient balance in their account. In an account-based CBDC system, during the initial creation of each CBDC account, the identity of the account holder needs to be verified and from that point onwards, payment transactions could be conducted

rapidly and securely. CBDC-W is proposed to be issued in the form of account-based form.

MOTIVATIONS FOR ADOPTION OF CBDC

1. **FINANCIAL INNOVATION**: A CBDC is about financial innovation, with the introduction of a new medium that serves as an enabler for a digital financial market. CBDC can be compared to the introduction of banknotes during the second half of the 19th century, aiming to bring new convenience to payments and responding to an evolving payments landscape to ensure central bank money will remain future-proof.
2. **FINANCIAL INCLUSION**: The central bank could potentially promote financial inclusion by providing access to a digital means of payment for the unbanked population. Similarly, for the underbanked population, the CBDC could serve as the foundation for new and potentially cheaper financial services provided by the private sector. Fintechs, for instance, could build upon the CBDC infrastructure to provide cheaper services accessible to the portion of the population that does not have access to an extended range of financial services, e.g. due to costs.
3. **CROSS-BORDER PAYMENTS**: Cross-border payments may involve numerous participants/intermediaries, time zones and jurisdictions with varying regulatory requirements, which greatly increases complexity, making such transactions slow and costly to process. The functionalities offered by CBDC are likely to have their biggest impact on international payments. A CBDC infrastructure could be deployed in a foreign jurisdiction, or designed to integrate several jurisdictions or to be interoperable with other currency systems through participation of non-residents, direct connections between networks, or common technological standards applied to the networks.
4. **SAFETY AGAINST UNREGULATED CRYPTOCURRENCIES**: Central banks have particularly been attaching great importance to financial stability since 2021, after the concerns have been raised regularly by regulatory and supervisory authorities of the potential systematic risks of cryptocurrencies. In fact, Advanced economies have also specifically indicated the emergence of stablecoins and cryptocurrencies as a reason for the acceleration of their work on CBDCs.
5. **PUBLIC ACCESS TO CENTRAL BANK'S MONEY**: As cash use declines in many developed countries, a CBDC can complement physical cash while providing access to potentially less risky central bank money to a larger population.
6. **RESILIENCE DURING CRISIS**: Distribution of central bank money has proven difficult, especially for those who do not have access to a bank account. This issue was highlighted during the pandemic with the struggle to efficiently deliver stimulus payments to unbanked Americans. Some have suggested that a CBDC could have sped up the process.
7. **CURB AGAINST CRIMINAL ACTIVITY**: It is occasionally observed that some portion of cash transactions, especially with larger denomination notes, could be related to criminal activity. Therefore, eliminating cash—at least larger-denomination notes—might inhibit criminal activity (Rogoff 2016). However, eliminating larger-value bank notes to inhibit criminal activity does not logically lead to, or require, a corresponding introduction of CBDC. And CBDC itself could also be well-suited for criminal activity if it were anonymous, as is cash. Thus, inhibiting criminal activity does not provide a compelling motivation for CBDC.
8. **SUPPORTS OUT-OF-THE-BOX POLICY MEASURES**: A common perspective following the financial crisis of 2008–09 is that the major economies were in a liquidity trap, where a chronic shortfall of demand required very low real interest rates

to move aggregate demand toward potential output. And, in practice, several countries have set modestly negative policy interest rates.

- The Swiss National Bank (SNB) reduced its interest rate on sight deposits to –0.75 per cent in January 2015.
- In Sweden, the Riksbank lowered its repo rate to –0.1 per cent in February 2015, and currently its benchmark interest rate is –0.5 per cent.
- The Bank of Japan has maintained its policy interest rate at –0.1 per cent since January 2016.
- The European Central Bank (ECB) benchmark refinancing rate has been zero since March 2016, and the rate on its deposit facility, which banks use to make overnight deposits with the Euro system, was set at –0.1 per cent in June 2014, and declined to –0.4 per cent by March 2016.

It has been suggested, however, that the lower bound on interest rates has prevented the real interest rate from falling to the equilibrium negative level required to remedy the persistent shortfall in aggregate demand. (Engert and Fung, November, 2017)

POTENTIAL CHALLENGES TO LAUNCH OF CBDCS

1. **The validation mechanism**: While account-based CBDC may suit wholesale CBDC applications, the token-based approach suits the retail needs at the scale that the Indian market requires. While RBI has discussed all the available options, experts believe India may take a hybrid approach down the line.
2. **Degree of anonymity**: There have been a lot of debates about the ways in which CBDC would impact privacy. A banker who was earlier associated with the project said, "The RBI's thoughts are very clear. For lower transactions, extend the maximum degree of privacy i.e. wallets with smaller limits will not ask for many personal details, but for advanced wallets, probably all the personal details will be required to fill in." Lohar, on the other hand, believes that CBDC will offer more privacy.
3. **Addressing cybersecurity**: Irrespective of whether CBDC is a centralised ledger or decentralised, counterfeiting and cybersecurity will remain the key concerns to address.
4. **Making people shift to CBDC**: Rastogi believes that making people aware of CBDC could be a huge challenge. "For retail, the government had earlier launched e-rupee tokens through NPCI. It is still evolving," he said, adding that the central bank must think in advance about frictionless conversion of CBDC into cash across the country.
5. **Technical challenges:** While Jio and Airtel have launched 5G in some cities, a large section of rural India still faces connectivity issues that may create CBDC issues. Besides, interoperability with the existing systems is another challenge which the RBI will have to address.

FUTURE STEPS AND CONCLUSION

As economies become increasingly digital, user needs are rapidly evolving, and innovation is reshaping user services. These developments have accelerated since the onset of the Covid-19 pandemic. To meet their intended public policy objectives, CBDCs would need to be adopted and used at sufficient scale in this fast-changing payments landscape. The weight of the different factors at play in determining whether users would adopt and use CBDCs

would largely depend on the public policy objectives and future market conditions in each jurisdiction. Experience with the introduction of previous payment innovations suggests that there is no "one-size-fits all" approach for ensuring adoption. Nevertheless, these experiences suggest some key lessons that are likely to be applicable in the future, such as satisfying user needs, harnessing network effects and not requiring new devices. Central banks should consider how the payments landscape is evolving, focusing on future innovation and demand to identify future user needs. They could accommodate evolving user needs by designing a flexible core system, and integrating a diverse ecosystem of intermediaries delivering choice, competition and innovation. A roll-out strategy for a CBDC would require balancing the needs of the majority of consumers and reaching smaller parts of the population that could be less well served. Understanding how the future landscape is evolving would require extensive and in-depth consultations with end-user groups, identifying payment needs and monitoring innovations in payments as they arise. Designing a CBDC that optimizes adoption across groups through meeting a diversity of user needs would likely require a diversity of private intermediaries in CBDC ecosystems (Group of central banks, 2021b). The next steps for this work are to continue research on and the impact of user requirements and financial stability safeguards on system design, and the range of approaches to public engagement and consultation on CBDC.

The Bank is deliberating on the various aspects of technological choices available, which includes, suitability of Tech Architecture(DLT/ Centralized/Hybrid; Open Source/ Proprietary), security of the Token Creation Process and Central Bank Node, standards and protocols to be followed by each stakeholder, robust preventive counterfeiting tech choices (Robustness of Verifier technology), security considerations; especially in offline transactions and smart contract features and its use cases in CBDC in both, Wholesale(W) and Retail(R) segment.

It will be incumbent on RBI to continue monitoring CBDC developments around the world while staying abreast of and potentially contributing to research and technical experimentation. This shall facilitate to stay up to date with the latest research, trends and findings related to CBDC, including those that can affect the economy and design policy measures to address the reputational risk associated with widely available retail CBDC.

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