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# Central Bank Digital Currencies in India; The digital Rupee: An alternative to cash or not

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## ABSTRACT

***With rapid changes in technology, digital currencies are gaining momentum across the globe. As of March 2022, 87 countries are considering issuing Central Bank Digital Currencies (CBDC), compared to the 35 countries in May 2020, showing the promise that Digital Currencies hold in the near future. One such country that has been making great strides towards digital currency and holds immense promise for its economic success is India. Digital Rupee—India's CBDC. The most basic definition of CBDCs are that they are a digital version of the fiat currency.***

***Keywords:*** *CBDCs, Distributed Ledger Technology, Blockchain, Digital Rupee, Intermediaries, Custodians, GDP*

## INTRODUCTION

CBDCSs stand for central bank digital currencies. It is a form of digital currency that can be used as a country's fiat currency and is issued by the central bank of an economy or the nation's monetary authority. While CBDCs have enormous potential to promote economic growth by enabling real-time transactions, they are still being explored in India to find out how the economy, financial infrastructure, and stability will be affected. On February 1, 2022, India's financial minister Nirmala Sitharaman declared that the "Digital Rupee" will be introduced by 2022-23.

CBDCs should not be confused with cryptocurrencies. CDBCs are digital currencies of physical cash issued by the country's central bank or monetary authority that has sovereign backing whereas cryptocurrencies are private asset classes that are not issued by the central bank of an economy. Both CBDCs and cryptocurrencies can be used as payment mechanisms but CBDCs transactions can be regulated and monitored as each transaction is recorded in a distributed ledger while cryptocurrencies are non-regulated and non-monitored forms of currency that can be used for licit or illicit transactions and activities. CBDCs use a private permissioned blockchain technology while cryptocurrencies use a public blockchain (Ethereum and Bitcoin). This essentially means that CBDCs provide more transparency in the system of transactions in the economy.

The CBDCs in India are likely to use blockchain technology which is a type of distributed ledger. A distributed ledger's function is similar to a traditional ledger – accounting for all the financial transactions that occur. However, this technology is electronic in nature and allows for the immediate transfer of assets from one node to another node, including retail and/or wholesale, without the need for a centrally coordinating entity, such as banks. This means that the anonymity that exists with cash could be eliminated, reducing organised crime as every transaction can be accounted for. However, this technology would require a very sophisticated cybersecurity network, which can be very expensive.

### Insight Into Digital Currencies

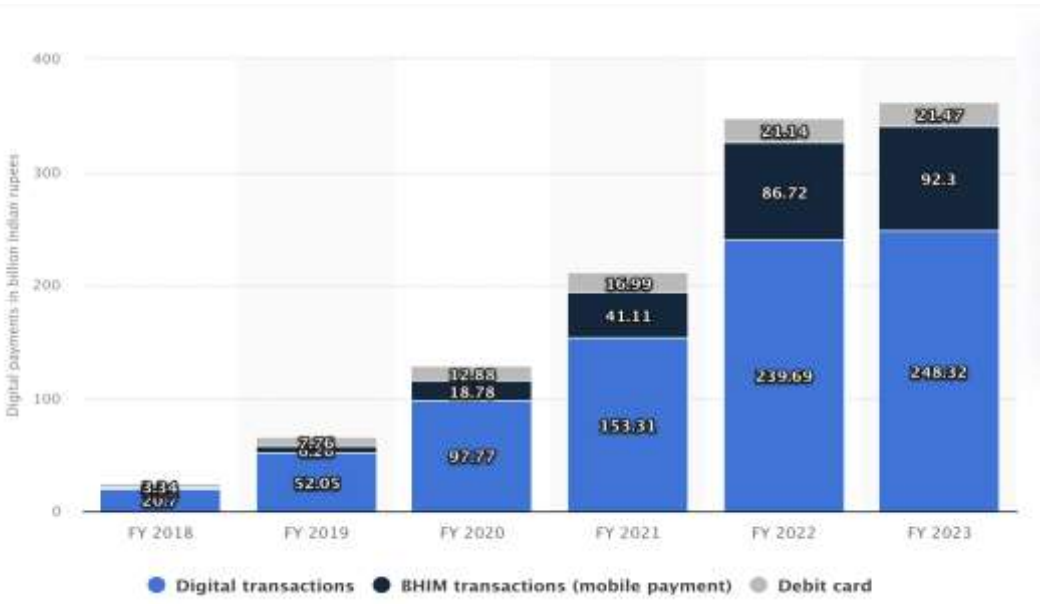
 

| Features | Digital Rupee | Cash | Bitcoin (crypto currency) | StableCoin | Commercial Bank Digital Money |
|---|---|---|---|---|---|
| **Definition** | Tokenized central bank or commercial bank money | | Privately issued token denominated in non-official currencies | Privately issued tokens backed by reservable assets and/or official currencies | Deposits – savings a/c, current a/c, or FD |
| **Creditworthiness & Safety** | Liability of the Central Bank (CBDC) or Commercial Banks (CBDR) | Liability of the Central Bank, thus the safest currency possible | Issued by an unspecified number of participants; Unregulated | Non-transparent backing reserves e.g., USDC issued by Coinbase | Liability of commercial banks and (in some cases) non-bank PSPs |
| **Interoperability / Acceptance** | High as it would be the official legal tender | High as it is the official legal tender | Low as not all merchants accept payments made in cryptocurrencies | Low as not all merchants accept payments made in stable coins | Not all merchants may accept payment made in different digital payment systems |
| **Programmability** | Yes | No | Yes | Yes | No |
| **Peer to Peer exchange** | Yes | Yes | Yes | Yes | Allowed via NEFT / UPI etc. |
| **Secure Information Sharing** | Yes | No | - | - | Yes |
| **Liquidity** | Yes | Yes | - | - | - |
| **Anonymity** | Controllable Anonymity | Full Anonymity | Anonymity in terms of identity but transactions are still recorded & traceable | Partial Anonymity | No Anonymity for digital deposits and transactions |

## History

In 1980, Nobel laureate James Tobin, an American economist suggested that the Federal Bank could make available a 'medium with the convenience of deposits and the safety of currency', but to no avail. The digitization of currency has been long spoken for but only the last decade has seen some pacy steps towards it. Recently, we have seen the digitization of stocks, securities and bonds from physical copies of paper to electronic statements in their bank accounts. In addition to that, during the ongoing pandemic we have also seen the exponential increase in cashless payments as means to reduce the risk of the transmission of the infection. This has given the monetary authorities of countries to come up with a digital version of fiat currency. Countries such as Sweden, Jamaica, China, South Africa, and many others have already made great strides in this particular area by undertaking various pilot projects. The Bahamas, Nigeria, Dominica, and many other countries have made even more impressive strides by fully launching their CBDCs in their country. India is on pace to be a part of this statistic as well with its phase currently in research and development.

## Cashless payments in India




As it can be seen the digital payments have continued to from 2019, growing at almost 50% every year from FY 2018-2022. While FY 2023 is not projected to show a 50% increase from its previous year, the value of digital transactions, however, are estimated to be more than FY 2022.

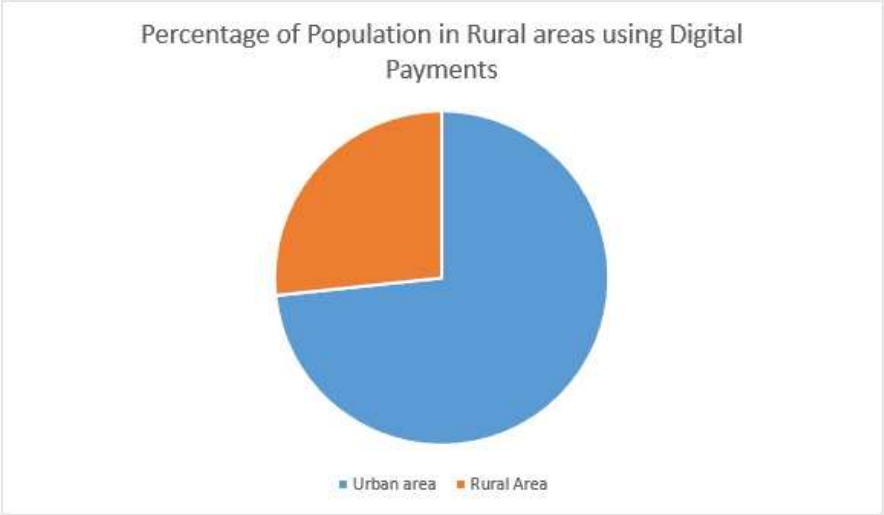
## Why is digital currency important for India?

**Lowering Cash dependence:**

According to the RBI, as of August 2022, cash in circulation in the economy of India was 31 lakh crores. Since the growth in acceptance infrastructure has not been constant throughout the country, the cash circulation is primarily this high due to the increased withdrawals from ATMs in rural areas because of the lack of POS terminals and illiteracy about digital payments.

**Comparison of Digital payments between Urban and Rural Areas**




As it can be seen in the pie chart above, almost 3/4th of the population urban areas uses digital payments while in rural areas only a population marginally more than 1/4th of their total population uses digital payments.

While the percentage of the cash in circulation might seem small, the amount does not justify this percentage of money in circulation around the country and provides scope for the conduct terrorist activities. Since terrorists can hide behind the anonymity of money, money laundering becomes a primary source of their funding and it would be extremely difficult to track the origin of money which they use for their illicit activities. To add on there is also a lower chance of getting mugged or robbed since a person walking down the street would essentially have no cash on him that a robber or mugger could extort.

Lowering the cash dependence in an economy is also more convenient because it would prevent withdrawals of small amounts again and again when a good needs to be purchased and it would also help to avoid the problem of collecting change every time a consumer doesn't have the exact amount which is to be paid.

**Cheaper to mint and store currency:**

Currency does not need to be printed now, which means the cost of production of printing paper on money reduces and also puts less pressure on the environment for paper from trees. According to market research estimates, the cost of printing a single 100 rupees note comes out to 15-17 rupees in a four-year cycle, which involves soiled notes coming back to the RBI via commercial banks and the printing of new notes. In addition to this, with 2000 rupees notes not being printed for more than 2 years now, and smaller denominations being circulated everywhere, the cost of printing money is very high. However, digital currency in the form of CBDCs does not require any money to be printed and could thus save the economy huge sums of money. It would also become extremely cheap and easy to store money because no vaults or lockers would be required as no physical cash would exist.

**Cheaper and Faster Cross Border Transactions**

Technology supersedes the speed of humans by a margin that cannot be quantified. With CBDCs, the transaction between two merchants will experience the same advantage. CBDCs can eliminate the need for intermediaries, so no third party would be involved in the transaction, which means that they will not take a cut for temporarily handling the money. This will result in cheaper transactions between any 2 parties. Furthermore, since third parties can essentially be eliminated, transactions between any 2 parties can happen in near real-time. For example, money would not need to be transferred from the consumer to the bank and then to the producer, it can directly go from the consumer to the producer, resulting in faster transactions. Therefore, the international trade in countries could see a rise, which means the quality of products produced in the country could increase and make them competitive on the international market. This can lead to an outward and rightward shift on the production possibility curve of a country and lead to economic growth.

**Welfare Distribution can be tracked and tax frauds can be prevented:**

According to a study conducted by the Working Peoples' Coalition in Delhi, an astonishing 95% of workers are not being given access to their legal minimum wage stipulated by the Delhi government despite the workers having the required set of skills. The minimum wage has been set at Rs 16,506 for unskilled workers, Rs 18,187 for semi-skilled workers and Rs 20,019 for skilled workers per month. However, it was found that 46% of workers received wages between Rs 5000-9000, 15% of workers received wages between Rs 3000-5000 and 13% of workers received wages between Rs 9000-12000. The cumulative total of 74% of workers are not being given access to the minimum wage set by the government for unskilled workers despite their probable qualifications. In addition to this, 98% of workers do not even receive pay slips.

CBDCs can help resolve this exploitation of workers practised all around India. The distributed ledger technology that the CBDCs will adopt can account for all the money that is being transferred and the government can see whether or not it meets the national legal requirements set by each state in the country. If an organisation is still found guilty of exploiting workers, they can be fined or

penalised by the government. Once workers are paid their minimum wages, they can consume more, which means aggregate demand will rise and the country's Real GDP will also rise.

Since CBDCs will be issued by the central bank, each and every unit of money can be accounted for, providing no scope for tax evasion and money laundering. Companies will no longer be able to hide any money from the government since there is no anonymity of cash. Each and every transaction will be recorded and noted in the distributed ledger and the firms will have to pay the tax mandated by the government. This will decrease the criminal activity of tax evasion and the tax revenue will increase, which will allow to increase the government spending and decrease the income inequality that so vividly exists in India. While it can be difficult to track the flow of money, CBDCs allow money to be tracked from the point of origin, and thus making it easier to track the money even if there are multiple circular transactions.

**Expected Monetary Policy Achievable:**

Since all transactions can be tracked, policy makers can understand the circulation of money in every sector at every level. Through this, the government can decide and execute the monetary policy with the greatest precision since they can understand exactly where people are putting their money since there is no anonymity of transactions. Since there is no anonymity of transactions, the government will not be oblivious to any transactions and there will be no time lag, in terms of recognition, implementation and behaviour. This means that the monetary policy can come into effect in near real-time.

However, this is not possible in cash transactions because of the anonymity of cash, resulting in a time lag for the policy to be implemented. For example, the economy might be in an economic boom and the government might decide to use contractionary monetary policy. By the time the government identifies that the economy is in a boom and implements a contractionary policy, the economy's business cycle might already be in a contractionary stage and increasing interest rates and reducing money supply will further lower the position of the economy on the business cycle, resulting in higher cost-push inflation.

**Cross border payments through CBDC**

Cross-border payments through CBDC have the potential to possibly transfer money from one country to another country in near real-time. For example, if a person in India wishes to pay for a good or service in another country, he/she can do so within seconds without the need for intermediaries and thereby reduce cost using distributed ledger technology. However, in order to achieve this sophisticated technology of CBDC through distributed ledger requires a lot of factors to be considered in its implementation.

## Factors to be considered:

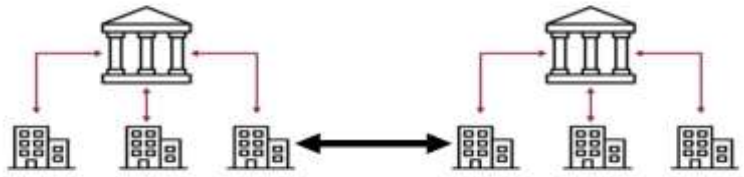
**Integration with Central Banks of other countries:**

Cross border CBDC payments will require the Reserve Bank of India to integrate and form a shared technical interface for the payment infrastructure with other countries' central banks. A key aspect of this remains not only the cross-border but also cross-currency and therefore a general clearing mechanism will need to be formed between all the countries who may wish to participate in cross border payments through CBDCs

**Access to wholesale or retail:**

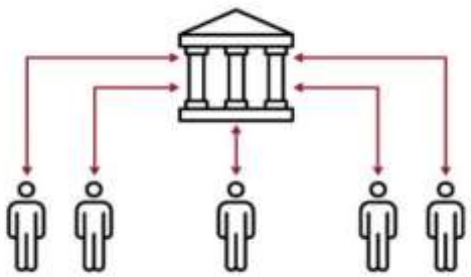
One big question that remains with Cross Border CBDC payments that remains is whether the access should be given only for wholesale payments or also for retail users. Wholesale CBDCs refers to providing CBDCs to financial institutions, such as commercial banks who have deposits in the central bank of the country for inter-bank settlements.

**Transfer of CBDCs for wholesale payments**



On the other hand, retail CBDCs refer to CBDCs being given to all retail users, which entails the entire population. The question that remains with retail payments is whether the access to cross border CBDC payments should be given only to residents of India or also non-residents of India who may have come here for the purpose of business.

**Transfer of CBDCs for retail payments**



**Legal regulations:**
The countries participating in cross border CBDC payments will need to have a fixed set of rules that govern and regulate the transactions between the 2 parties. For example, If Country A adopts an anonymous CBDC wallet infrastructure, India may not be comfortable with it because they do not permit anonymity in their CBDC transactions and it may also not meet their KYC (Know your Customer) requirements. Therefore, global discussions are needed to decide on the legal frameworks that outline cross border CBDC payments

## Custodians for CBDCs

Custodians, just like in traditional financial markets which use cash, are responsible for safeguarding an investor's digital assets.

Unlike the system of traditional financial markets which use vaults and lockers, digital currency custodians safeguard an investor's assets through safe key management, allowing the assets to be cryptographically secured. Private and public keys are issued which allow the investor to use his/her assets.

A private key is generated using a combination of random binary digit numbers and is used to encrypt and decrypt information and its contents are made available to the originator of the encrypted content.

A public key is cryptographically derived from a private key and is available to many. For a transaction to occur, the public key must be correctly paired with the private key and its contents.

Custodians hold the private keys on behalf of investors and ensure that it cannot be obtained by anyone else as it is the most essential thing in ensuring security of digital currencies. This is because private keys can be used for all transactions and if the key is lost or stolen, it may be difficult for the investor to recover its digital asset unless and until the digital asset is a representation of an actual asset. In addition to that, most transactions using the distributed ledger technology are irreversible. In the application of CBDCs, there exists 3 types of custodians:

**Self-Custodians**
If an individual decides to take self-custody of his/her digital assets, they may just store their private key on some software/hardware, like a USB device

**Exchange Wallets**
In exchange wallets, the investor of the digital asset gives control of the private and public keys to an exchange but maintains control via an online wallet. Therefore, the exchange wallet is responsible for the safeguarding of the private key and the digital assets.

**Third Party Custodian**
A third-party custodian is one which stores digital currency on behalf of investors using specified groundworks and legal procedures to safeguard their digital assets. This type of custodian has the greatest security because they are primarily designed for companies or organisations who invest money on behalf of others and therefore have the most sophisticated security and insurance for the digital assets.

## Risks associated with CBDCs

**Credit Risk of Commercial Banks**
Reduction in deposits: The disintermediation of banks can account for a massive problem in the economy. This essentially means that deposits in the bank will reduce which in turn means that banks will not be able to give out loans and make their money through the interest rate they charge on loans. However, the impact on deposits of banks might not be so high because consumers and firms might still view banks as a traditional investment because the amount of money consumers and firms invest will not fluctuate constantly due to a constant interest rate, therefore keeping deposits amount roughly the same as an opportunity cost to avoid higher risks.

Managing Higher Liquidity**:** If a bank holding CBDCs seems to perform badly, it could raise questions about the ability of the bank to manage cashless funds in the future. This can result in consumers withdrawing their money. Since the withdrawals of this type of currency can be done much faster than cash withdrawals, consumers might become a little laid back and not rush to the bank hastily to make their withdrawals. However, a consequence of this is that banks may have to keep a higher liquidity ratio as consumers can call for an unexpected amount of money at any given time. A higher liquidity ratio means that the bank's credit multiplier will be lower. This will lower their returns on deposits since their ability to give out loans to individuals, firms, and government institutions decreases, resulting in lower investment. To add on, the banks' capital ratio might also decrease because their financial capital will fall as a result of fast withdrawals any time the bank is under pressure, which means that banks' ability to cover their riskier assets will fall, resulting in banks unable to survive a period of recession or unexpected losses and thus going out of business eventually

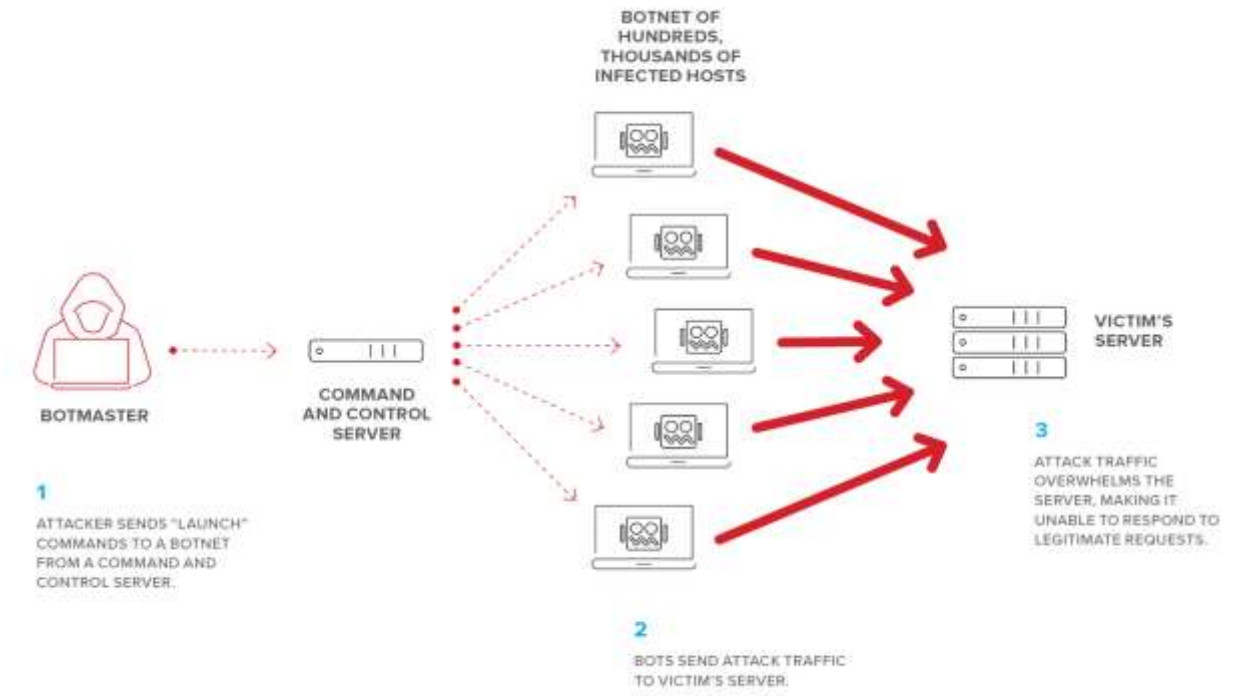
**Operational / Technological Risk**
While the economy would most certainly flourish through CBDCs, the sophisticated blockchain technology that the economy plans on using could still be susceptible to the Denial of Services attack, DDoS. The blockchain technology creates 'blocks' at regular intervals with a restricted limit of blocks to prevent overloading of capacity. Any transaction that does not fit the current block will be stored in mempools and be considered in the next block. The traditional DDoS attacks could result in transaction flooding, causing legitimate transactions to sit in mempools while the illegitimate and spam transactions rest in the blocks of the technology.

This can reduce the speed of everyday operations and transactions causing network congestion and a bloated distributed ledger, which can put the entire economy at risk and a state of panic.

Network Congestion and Bloated Ledger: Since blockchain uses a point-to-point technology, each node on the blockchain will either receive or send a copy of its transaction to another node with whom/which the transaction is being made. Since DDoS attacks replace legitimate transactions with spam transactions, each node would now see multiple copies of the same transaction, amplifying the magnitude of transactions which takes up more network bandwidth. In addition to this, the inflexible nature of the distributed ledger means that the spam transactions cannot be eliminated, paving way for eternal impacts on the technology and the ledger as transactions are virtually unverifiable due to the multiple copies of the same transaction being made by DDoS.

**How DDoS attacks work**




The infrastructure of the CBDC: The infrastructure of the CBDC surely requires high-speed internet connectivity throughout the country with advanced firewall systems, which are expensive to install and maintain. Network towers, routers, and dongles will need to be made available everywhere because without a high-speed internet connection available everywhere at any time, CBDCs could rather actually increase transaction times than reduce. Power outages or network crashes will result in no transactions being made and consumers and producers may withdraw money from banks, putting them under enormous amounts of pressure.

**Labour Risk**

Requirement for skilled workers: The implementation of CBDCs around the country is a complicated venture and requires the expertise, skills, and knowledge of workers to be of the highest calibre for it to be executed. Workers would need to create and design an interface that can be understood easily by citizens with low literacy. In 2021, there were five major data breaches, making India the third largest victim of growing cybercrime. This impacted over 150 million users, whose identities now loiter over the internet, leaving them susceptible to cyber fraud and identity and online theft. With the financial literacy of citizens being low, the extent of cyber fraud in the country could extend to CBDCs. With digital payments expected to rise to a trillion dollars by 2026, the workers involved in designing the infrastructure of the CBDCs would need to create an elaborate and complicated network of firewalls and gateway and a secured encryption platform to maintain the security posture of CBDCs. This can be extremely expensive and would require massive amounts of time to be invested in it and even after all this, the network can still possibly be susceptible to attacks.

Workers cannot match the speed of technology upgrades: The CBDCs framework will need to be regularly updated and constantly maintained and tracked on the distributed ledger. The system would practically need to be bug-free at all times which would require constant upgrades. The coders of the CBDCs network infrastructure might not be able to keep the system this way at all times as bugs can arise even after the execution of the system. By the time the workers identify the bug, and a worker upgrades the system, it might already be late and new bugs may also have arisen by then. This means that as one bug is removed from the system, another might form and since technology is way faster than humans, this loop of bugs may ultimately become a very huge number, leaving workers to upgrade the network system without actually shutting it down and removing them all at once. This means that during this period, no transactions would be made and consumers will not be able to purchase anything and suppliers will not be able to sell anything.

**Regulatory Risk**

To regulate means to keep something in order or to abide by the law. Given that regulations are evolving, if CBDCs are permitted to retail and wholesale, all of them will have to adapt to these changes very frequently in a short span of time. Therefore, the roadmap that banks have initially designed for CBDCs might get derailed because regulatory changes issued by the central will need to be prioritised to maintain law and order. This could do more harm than good if banks are not able to cope with the speed of regulatory changes.

**India's strides towards CBDCs**

In 2021, the RBI launched an independent department called the Fintech Department that has been looking into the project of CBDCs and its implementation across the country. An anonymous RBI official informed Inc42 that "As we are on the cusp of fintech revolution, there remains a host of issues such as faster, better and secure way of cross-border transactions, a larger focus on DLT (Distributed ledger technology) applicability, securing consumer data and privacy and so on."

While sources close to the project told Inc42 that the National Payments Corporation of India will be actively assisting the RBI on the CBDC project, this news has not been officially confirmed. In addition to this, skilled workers from IIT Bombay and iSPRIT foundation could also be brought in for the technology and designing of the infrastructure aspect (Blockchain and Distributed Ledger Technology)

The RBI claimed that "The introduction of CBDC has been declared in the union budget of 22-23 and an appropriate amendment to the RBI Act,1934 has been included in the Finance Bill 2022. The Finance bill, 2022 has been enacted, providing a legal framework for the launch of CBDCs"

India could also take inspiration from the e-krona project of Sweden and the Jura project that involved the direct transfer of Euros and Swiss Francs wholesale CBDCs between commercial banks of the 2 countries on a single Distributed Ledger Platform.

## CONCLUSION

CBDCs are a new frontier for payments infrastructure and central banks. Their geopolitical ramifications cannot be underestimated. CBDCs pave the path for circumventing sanctions, forming new alliances, and establishing norms around identity, privacy, innovation, and cybersecurity. The nascent technology, however, is being explored in India to find out if they will have more harm than good in India or more good than harm in India for retail as well as wholesale payments using the Distributed Ledger Technology.

The development of CBDCs tasks India to reimagine money in a more equitable and efficient model. Clear voices will be needed to offer common values for India to coalesce around as the payments system is transformed.

## REFERENCES


[1] https://halborn.com/how-blockchain-ddos-attacks-work/
[2] https://www.moneycontrol.com/news/opinion/cbdcs-are-powering-the-next-generation-of-cross-border-payment-solutions-8373881.html
[3] https://www.rbi.org.in/Scripts/BS_SpeechesView.aspx?Id=1111
[4] https://www.atlanticcouncil.org/cbdctracker/
[5] https://www.ndtv.com/business/here-are-the-timelines-and-status-of-central-bank-digital-currencies-in-some-countries-2820164
[6] https://www.livemint.com/opinion/columns/does-india-really-need-a-central-bank-digital-currency-11657642735128.html
[7] https://www.drishtiias.com/daily-updates/daily-news-editorials/a-pros-and-cons-analysis-of-the-cbdc
[8] https://rbi.org.in/scripts/BS_ViewBulletin.aspx?Id=20438
[9] https://www.businessworld.in/article/India-Must-Build-A-Strong-Cyber-Infrastructure-Before-Welcoming-CBDCs/29-07-2022-439486/
[10] https://www.imf.org/en/News/Articles/2022/02/09/sp020922-the-future-of-money-gearing-up-for-central-bank-digital-currency
[11] https://www.investopedia.com/terms/c/central-bank-digital-currency-cbdc.asp
[12] https://inc42.com/features/decoding-indias-cbdc-project-the-ambitious-plan-to-launch-indias-digital-currency/
[13] https://www.worldbank.org/en/topic/financialsector/brief/blockchain-dlt
[14] https://economictimes.indiatimes.com/news/economy/policy/plan-to-introduce-cbdc-in-india-within-fy23-but-gradually-rbi/articleshow/92076728.cms
[15] https://timesofindia.indiatimes.com/city/delhi/95-of-workers-not-paid-minimum-wages-in-delhi/articleshow/92789450.cms
[16] https://rbi.org.in/Scripts/Data_MSupply.aspx
[17] https://www.lyra.com/in/should-payment-gateways-in-india-take-a-rural-route/
[18] https://www.outlookindia.com/business/all-you-need-to-know-about-wholesale-and-retail-central-bank-digital-currency-cbdc--news-192971
[19] https://www2.deloitte.com/content/dam/Deloitte/xe/Documents/finance/me_Digital-Custodian-Whitepaper.pdf