DIGITAL TRANSFORMATION WITH CBDC - GENESIS, NEED AND FUNDAMENTALS FROM A COMMON MAN'S PERSPECTIVE

CMA (Dr.) Paritosh Basu
Senior Director (Services)
Stragility Consulting Pvt. Ltd.
Mumbai
paritosh13286@outlook.com

Introduction

Central Bank Digital Currency (CBDC) is gradually becoming a subject matter of discussion amongst professionals across functional domains and slowly making inroads into minds of common people also. One of the major reasons could be the smart phone-based Apps. Those influence a common man's way of living life by dependency-based habituation and creating positive impacts on several counts. In India people are also enjoying benefits of digitisation and digitalisation of several macro level operating ecosystem like those for healthcare, provident fund, railways, etc.

A roadside vegetable or street food vendor displaying a QR code and getting a voice message in few words towards confirmation for receipt of payments from a small device might have not escaped eyes and ears of readers even in C class towns of India. This indicates her/his acceptance of payments through digital mode for direct credit to bank account instead of paper fiat currency. Therefore, a common man with just the primary level of digital literacy and aptitude for using a smart phone is convinced about all that are happening in digital space are making her/his life easy and hassle free. Even large merchants are also adopting QR Cordes to avoid higher commission payment to credit card operators. People are thus getting accustomed with the convenience and benefits being provided by digital technologies.

All these are yielding financial benefits at national level due to speed, operating cost optimisation, lesser circulation of paper fiat currency, widening of tax bracket by reduction in unrecorded transactions, and so on. Such benefits would continue to multiply as disparities in digital literacy and wireless connectivity between Bharat and India keep reducing. The latent demand from common people is perhaps more in terms of new additions and upgradation of existing ones to ensure more transparency, safety, privacy,

Image Source: *https://me.mashable.com/tech/17220/omans-central-bank-head-hints-that-the-country-is-working-on-its-own-digital-currency*

and security.

Objective

This article has been written keeping in view the need of professionals across functional domains and common man to know more about central bank digital currency. It is also essential to remove the smoke and haze of scepticism and misgivings spread on legitimate digital currencies by evils and abusing of private cryptocurrencies. The subject has assumed enhanced importance because the Reserve Bank of India has initiated pilot run of the first retail digital rupee or central bank digital rupee (e₹-R or CBDC-R) on December 1, 2022. Eight Indian banks from both public and private sectors have been identified to participate in the pilot run in four major cities to start with. Later the pilot run will be extended to nine other cities. RBI had earlier launched pilot run for India's wholesale CBDC on October 31, 2022 and is reported to be running successfully.

Keeping the above developments in view, it is an imperative for professionals to proactively achieve a state of readiness with knowledge so that they can plan and design future initiatives for digital transformation of their entity keeping CBDC as an option, if not imperative. Moreover, they would also be personally benefitted by learning more about retail digital rupee.

The Set Stage for CBDC

Continuing with the discussion of the above introduction section, one can start extrapolating and think more from a common man's perspective what more benefits can be provided if further advanced technologies are offered to ensure more immutability, transparency, security, safety, privacy, and regulatory and legal compliances. It is needless to mention that common people generally prefer to remain under the comfort of a regulatory and secured environment, more so on matters of money and banking.

Readers might have guessed what is being indicated here is a blockchain technology driven platform at the back end and a simple App at users' frontend. Such a solution, when offered, would not take much time to be effective and popular because the stage has already been set by the hard work for BHIM (Bharat Interface for Money), PhonePe, GPay, Paytm etc. the converging platform for which is United Payment Interface (UPI) of India. Incidentally several countries, viz., Singapore, UK, Netherlands, South Korea, Vietnam, Indonesia, Hongkong, Malaysia, etc. are interested to adopt the UPI model crafted by India to enable seamless cross border transactions. One of the beneficiary groups would be tourists.

Till recently even for majority of intelligentsia, not to speak of common people, Blockchain was synonymous to cryptocurrencies, or cryptos as is popularly called, because of two major reasons. Blockchain platform-based digital Apps have so far not been offered for use by common people. Secondly, people have heard about blockchain being used only for private cryptocurrencies. But since 2009, the year of Bitcoin's birth, blockchain has successfully been used for multiple use cases business and governmental functions which have still not reached a common man's handheld phone. The technology itself has advanced through the course of evolution including for integration with many other digital technologies. Information for all such uses cases is not available to common man.

On the other hand, having experienced proliferation of private cryptocurrencies and other use cases of blockchain technology, central banks of sovereign nations and global multilateral agencies started researching and exploring from around 2015. Their objective was to find answer to the question why the central bank of a sovereign nation cannot issue digital currency using a blockchain platform if a private cryptocurrency can be issued. Their research also included comparative study on various aspects of cryptocurrencies vs. CBDC. Since then, many initiatives around world have brightened the future of CBDC coming to a reality in foreseeable future. However, general awareness about the benefits of blockchain technology would have to be created more because the platform for offering and administering CBDC would be Blockchain.

Cryptocurrencies' Wading History and Birth of CBDC

The author has in one of the chapters of bis Book[1] (2022) on Central Bank Digital Currency (CBDC) has briefly captured the evolutionary history of media of exchange for transaction settlement from *'cowrie shells'* to stone coins to metal coins to paper currency notes to cryptographed digital currency. According to his findings the first ideation of a digital or virtual currency could be traced in a published paper of Wei Dai, an IT engineer of the USA, in 1998. He ideated a digital currency called 'B-Money' and developed a platform which can enable a group of imperceptible 'Digital Pseudonyms' to transfer and receive values within a people-to-people network. Nick Szabo, a lawyer turned professional cryptographer of the USA, revealed his idea for a digital currency in the same year. He named it as 'Bit Gold'. Historians of digital technologies also regard him as one of the pioneers of blockchain technology.

However, unfortunately both the ideated platform and digital currencies of Wei Dai and Nick Szabo were not implemented for general use and conducting actual transactions. The next story is of Satoshi Nakamoto[1], *"The world witnessed birth of the first cryptocurrency 'Bitcoin' in 2009 through the widely read article "Bitcoin: A Peer-to-Peer Electronic Cash System", published by Satoshi*

Nakamoto[3]*. Predominant objectives of Bitcoin was to liberate liquid assets of common people from the clutch of central bank of a country, so that people can control their own destiny.*" And the rest is history.

Debates are continuing since 2009 to find the right answer to the question whether Wei Dai, Nick Szabo and Satoshi Nakamoto are the same person. World also debated whether Satoshi Nakamoto is the name of a team of IT technocrats from whose collaborated efforts emerged the first ever private cryptocurrency, i. e. Bitcoin or BTC. Leaving the debate at its own place, the first ever cryptocurrency, i. e., Bitcoin is still alive and has been followed by issuance of thousands of private cryptocurrencies.

As per a report in Exploding Topics[2] by Josh Howarth on November 25, 2022, the world has seen issuance of about 21,800 plus private cryptos out of which as of now about 9,300 plus exist with about 300 million plus users. 18,000 entities are accepting payment in cryptocurrencies. However, active cryptos are around only 200. The rest have died their natural death including certain stable coins which were stated to be issued with USD as the linked currency. Albeit market capitalisation of any cryptocurrency, including Bitcoin the flag bearer, is subject to extreme volatility, one may know more about market capitalisation status of 200 major cryptos at the site of CoinMarketCap.[3] For interested readers the following is a graphical presentation of fluctuations of Bitcoin through the ominous path as reported by Coindesk on December 24 around IST 15.19 hours.

Source: https://www.coindesk.com/price/bitcoin/

Bitcoin's price history is chequered by both astronomical hikes and stiff cliff-hanger falls. Readers would observe that the afore-shown BTC price of USD 16,828.78 as on the date of this study is about 75.6% lower than its highest ever price of USD 68,990.90 reached some time in November 2021. However, this price is about 8.7% higher than its last 52 weeks' lowest price of USD 15,480 in November 2020. Readers may be aware that total supply of Bitcoins is finally fixed at 21 million. However, there are debates whether that number would ever be reached[4].

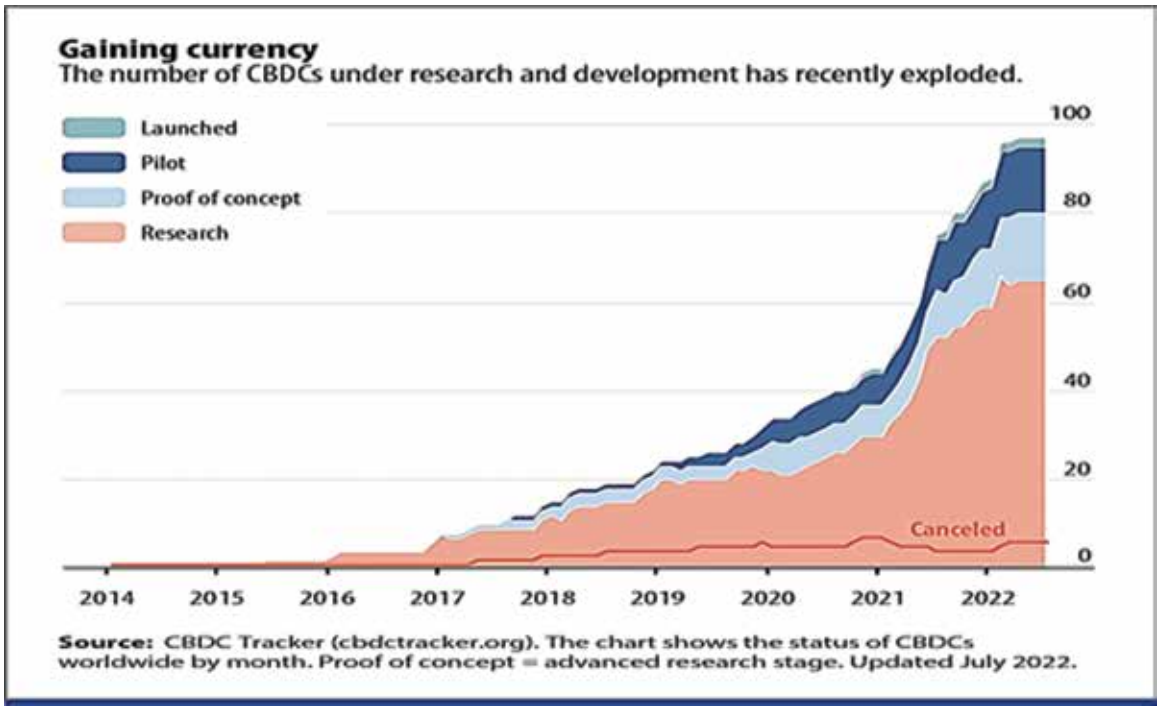
Emergence of Cryptocurrency from the Phoenix of CBDC

A detailed study of rest of the private cryptocurrencies would reveal the same features of volatility due to sympathetic linkages with Bitcoin of varying degrees. History of a few Stablecoins, issued in recent past, does not also provide any sense of comfort. These brief narratives provide characteristic features and fearful price volatilities of private cryptos. Readers would appreciate and be convinced that if the CBDC of any country is to be used as a valid tender for settlement of transactions and store of value in a digital account called wallet, the above private cryptocurrency like features would never be acceptable to any citizen/ netizen.

Sarika Murty et. al. concluded in their research paper[5] (July 2022) with data collected from November 2017 to November 2021 that, *"…. given the supply of Bitcoin is fixed, low returns realisation is equivalent to excess supply over demand wherein investors are selling off Bitcoin during bad times. … overall analysis shows that Bitcoin was not considered a safe hedge and an investment option by Indian investors during the study period."* The

present author is of strong personal view that no private cryptocurrency should ever be permitted to be used as a legal tender for any transaction settlement. Those should be left as a separate asset class for those investors who loves to play with fire driven by greed and gluttony. However, in present Industry 4.0 era every country must have a digital fiat currency of its own as an alternative to Central Bank Paper Currency (CBPC) or hard cash. Therefore, CBDC is the only option for making an end to end digitally administered monetary system available to countrymen. And for that a blockchain based platform, i. e, with distributed ledger technology is the only option.

It is obvious that central banks of sovereign nations across the world and global multilateral agencies like IMF, World Bank and BIS would be excited and enticed by the benefits provided by a digital currency and blockchain technology. They would also be encouraged by savings in expenses and other risks of CBPC that would be averted if digital fiat currencies can be popularised inter alia as an effective alternative for paper currencies. And indeed, this is happening! CBDCs are now proliferating globally driven mainly by the multifaceted benefits of Blockchain and other digital technologies. The author urges readers to visit the webpage of Global CBDC Tracker at https://cbdctracker.org/ for regular updates on what all are happening around the world.



Source: https://www.imf.org/en/Publications/fandd/issues/2022/09/Picture-this-The-ascent-of-CBDCs

The above graphic used in a report by the International Monetary Fund[6] reveals that by July 2022 central banks of around 100 countries were at varying stages of working with CBDC, viz., research, proof of concept, pilot run and launch for public use. By July 2022 two countries have issued CBDC, viz., Nigeria had issued eNaira in October 2021 and Bahama had issued 'Bahamian Sand Dollar' in October 2020. India is now in pilot run stage of eRupee e₹ or Central Bank Digital Rupee (CBDR). It has recently been confirmed by Governor of the Reserve Bank of India that eRuppe would be issued and administered through a Blockchain platform.

Fundamentals of CBDC

The history of CBDC as a concept can be traced back to 1993 when Finland initiated the 'Avant Smart Card' which was an electronic form of cash. It did not survive for long and was discontinued in 2006. The present form of CBDC, as are being worked upon by various countries, are predominantly to be in the form of virtual or digital currency to be administered through Blockchain platforms. Options are there for using some other ICT and/or digital technologies.

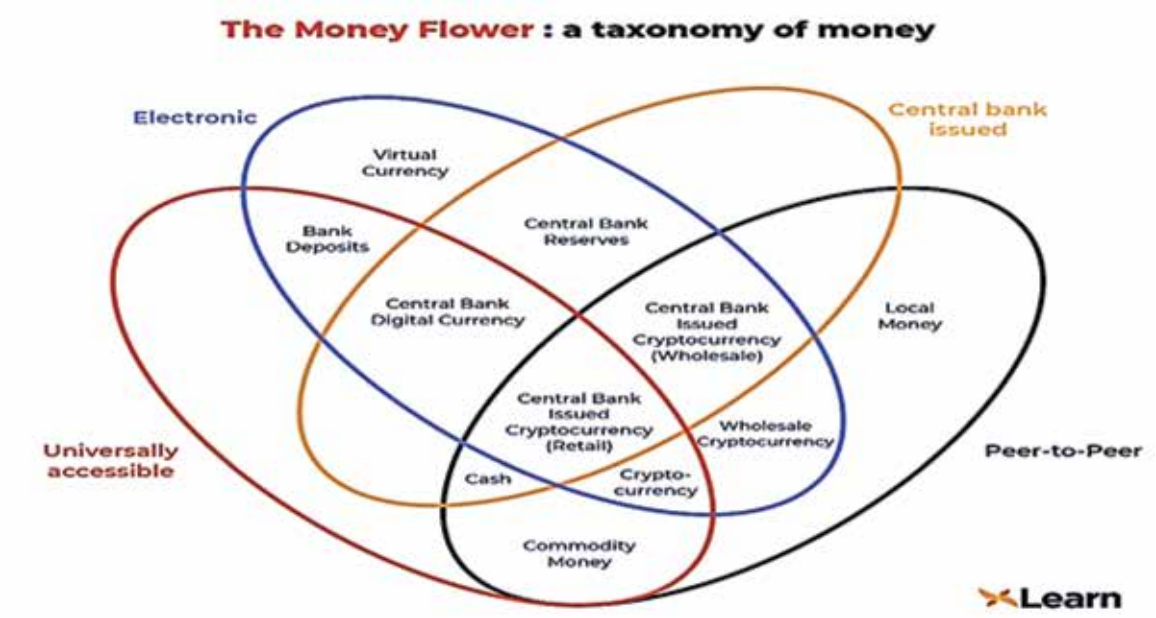
The foundational argument of Satoshi Nakamoto for launching Bitcoin was to liberate the fate of millions of users of money from the clutch and control of any designated regulatory agency called the central bank. This argument sounded to be logical to many thinkers in the backdrop of devastating impacts of Subprime financial crisis of 2008 that left no country unaffected. However, any proposition that aspires to be

autonomous and defy the need for regulation and control, even while dealing with the financial fate of billions of people, bound to fail. That is bound to be abused and exploited by people being driven by human greed and gluttony for selfish benefits. And that is what has exactly happened. The latest episode was that of FTX which has been termed as the greatest financial fraud in the history of USA. Readers need not be reminded that exchanges for cryptocurrencies are the safe harbours of drug peddlers, terrorists, illegal arm seller and operators of dark webs.

Two diagonally opposite characteristics of a CBDC, as compared to any private cryptocurrency, are the back up guarantee of issuing central bank of the concerned sovereign nation with the backup of its reserve and thus making it secured like paper fiat currency. It is also designed to remain under the centralised control of that bank for many aspects including quantum of circulation. These two does not defy logic, because if the comfort of backup security is being sought after having burnt billions of dollars equivalent money in cryptos, the control of the guaranteeing authority must have to be accepted.

Deloitte Global[7] has defined CBDC as "*a digital payment instrument denominated in the national unit of account that is a direct liability of the Central Bank (BIS 2020, 3). It is the legal tender issued by the Central Bank in a digital form as a medium of exchange, store of value and unit of account. It is a fiat currency issued in a digital form and has the same value as the fiat currency*"

Therefore, a CBDC in common parlance is the virtual or digital version of fiat currency of the issuing country's central bank. It can be regarded as safe and secured as that of the fiat paper currency. The following graphically illustrated Taxonomy of a CBDC will make the definition further clear.



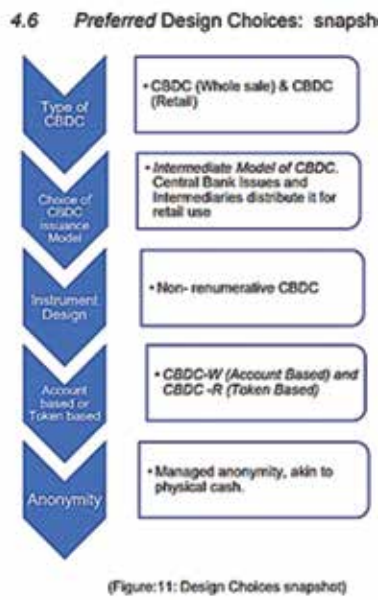
Source: https://dcxlearn.com/cryptocurrency/cbdc-central-backed-digital-currencies-explained/

A careful study of the above 'Money Flower' reveals that each flower-petal shaped space encircled by different coloured lines represent one feature each of an eCurrency. The space encircled by different combinations of intersections of those petals can help construct the following short definitions:

- CBDC: The digital form of a country's fiat currency issued and administered by its central bank through an electronic platform via internet. Such a digital currency is a liability of the central bank and is backed by its Reserve. Thus, it derives the characteristic of a valid legal tender for settlement of monetary transactions.
- Retail CBDC: A nation's fiat currency which is issued and administered by its central bank through an electronic platform, universally acceptable and backed by the Reserve of its central bank.
- Wholesale CBDC: A nation's fiat currency which is issued and administered by its central bank through an electronic platform in a peer-to-peer network, i. e., amongst banks and is backed by the Reserve of its central bank.

Reserve Bank of India has defined a CBDC "*.... as the legal tender issued by a central bank in a digital form. It is akin 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. CBDCs would appear as liability on a central bank's balance sheet." It would be worthwhile to further quote here the following three excerpts and the graphic from the 'Concept Note on Central Bank Digital Currency'[8] issued in October 2022 by FinTech Department of the Reserve Bank of India:



(Figure:11: Design Choices snapshot)

".... The e₹ will provide an additional option to the currently available forms of money. It is substantially not different from banknotes, but being digital it is likely to be easier, faster and cheaper. It also has all the transactional benefits of other forms of digital money."

"... CBDC is a direct claim on the central bank, which also keeps a central ledger of all transactions and operates a backup technical infrastructure allowing it to restart the payment system if intermediaries run into insolvency or technical outages."

"CBDC, being a sovereign currency, holds unique advantages of central bank money viz. trust, safety, liquidity, settlement finality and integrity. The key motivations ..... include reduction in operational costs ,,,, fostering financial inclusion, bringing resilience, efficiency, and innovation in payments system, adding efficiency to the settlement system, boosting innovation in cross-border payments space and providing public with uses that any private virtual currencies can provide, without the associated risk."

Source: RBI's Concept Note on CBDC, October 2022

https://rbidocs.rbi.org.in/rdocs/PublicationReport/Pdfs/CONCEPTNOTEACB531172E0B4DFC9A6E506C2C24FFB6.PDF

The above narratives confirm that a CBDC does not represent a claim on any commodity or asset unlike any digital token or virtual asset which represent the fractional value of tangible or intangible asset. It is essentially the digital incarnation of CBPC. Therefore, CBDC is a fungible legal tender issued in compliance with monetary policy of the concerned country. Readers will recall that the fundamental objective behind the first crypto, i. e.oin and subsequently of all other cryptos, issued by autonomous communities, is to abolish the role of any intermediary and any central agency. The following is a summarised comparative analysis of CBDC, CBPC and Private Cryptocurrencies prepared by Deloitte:

Comparative Analysis of CBDC with Paper Currency and Private Cryptocurrency

Aspect	CBDCs	Cash	Alternate private currency
Issuing Authority	Issued and backed by a central monetary authority	Issued and backed by a central monetary authority	Privately owned, governed by algorithms
Form	Electronic/Digital	Paper/Physical	Electronic/Digital
Guarantee	Issued by the Central Bank as their liability	Issued by the Central Bank as their liability	Privately issued
Payment acceptance	Legal Tender	Legal Tender	Limited acceptance
Know Your Customer (KYC)	Required in most cases	Transfer doesn't require KYC	May not be required Anonymity is high
Structure	Centralized or permissioned decentralization	Centralized issue	Decentralized
Risk	Very low market, counterparty, liquidity risk	Very low market, counterparty, liquidity risk	Relatively medium to very high market, counterparty, liquidity risk

Source: https://www.deloitte.com/content/dam/assets-shared/legacy/docs/perspectives/2022/gx-fsi-central-bank-digital-currencies.pdf

Analysis of the above definitions reveals that the essential differentiating feature of CBDC versus CBPC or Cash is the mode of issuance and that the digital form as against paper form. This would also lead to people being accustomed to a different App on their hand-held device because the backend would not be the legacy net-banking or mail-banking platform of a commercial bank. CBDC would also obviate layering in the transaction process and thus would help minimising third party risks. However, centralised authority to monitor and control would continue to remain with the central bank of the country

CBDC - A Common Man's Perspective

The above narratives on the fundamentals of CBDC, particularly the quoted excerpts from RBI's Concept Note provides lots of comfort by removing several doubts and reaffirming certain features of CBDC which are exactly in line with those of CBPC. The following is a summary of features of India's CBDC or digital Rupee from a common man's perspective, which would almost be the same as those of CBDCs of other countries:

1. Retail CBDC, i. e., CBDC-R of the RBI, is a Digital Token in lieu of CBPC for retail transactions, whereas CBDC-W will be used for wholesale transactions by and between banks and RBI.
2. CBDC-R will take the form of digital tokens in denominations for which paper currencies and metal coins are presently available in India.
3. The depository ledger unit for every individual's CBDC-R will be called a 'Digital Wallet' to be opened in the name of each user and linked to the RBI's ledger maintained using Blockchain platform or engine. This engine would be separate from the one for CBDC-W.
4. Individuals can perform transaction with another individual or a bank from handshaking distance as are being done now using paper currency as well as while remaining geographically separated through internet. However, the physical currency will be replaced by an App on smart phone. The hassles of counting physical currency notes will be over.
5. Tokens for CBDC-R will be distributed by RBI's 'Token Service Providers' (TSPs) which would be the new roles of banks in the context of digitalised Rupee.
6. Users would be able to exchange CBDC-R with paper currency and vice versa with the help of TSPs.
7. CBDC-R would be accounted by both TSPs, and RBI as positive balances of each wallet would be a direct claim on RBI and thus its liability.
8. Users of CBDC-R would get the same anonymity as is presently available while using CBPC.
9. As per the declaration of the central government of India's CBDC that eRupee will be administered through blockchain platforms and hence will provide all benefits ensured by Blockchain technology.
10. Under RBI's CBDC-R regimentation any user would be able to withdraw eRupee tokens against cash and vice versa as well use for payments and remittances through internet.
11. In the existing non-digital fiat currency system, there is no distinction between uses for retail operations vis-à-vis individuals and wholesale operations between banks. However, the settlement between banks and between RBI and any bank is done on a bulk basis. While designing Blockchain platforms or engines for CBDC it would be beneficial if two engines are maintained for such retail and wholesale operations keeping options for interoperability between the two for transferring gross amounts and inter-bank liabilities. Essentially money value of each digital token would remain as the same under any circumstances.
12. Both CBDC-R and CBDC-W can provide all operating features, efficiencies, and effectiveness which any private cryptocurrency can offer for creating multi-faceted blockchain based operating solutions for industry, trade, and commerce as well as governmental agencies and NGOs. Thus, CBDC in no way would hinder the process of moving ahead with digital transformation in every segment of any country's economy.

The later part of paragraph 4.3.4 iii of the aforesaid Concept Note of RBI provides: *"CBDC also supports innovation with an ability to include programmable feature that supports efficiency such as standardisation of compliance rules, fraud detection, ... Further, token-based CBDC-R can be used to accomplish financial inclusion goals."* Hence CBDC would bring inclusive happiness and inclusive smile.

Interest Payment on CBDC – The Issue to be resolved

Payment of interest on positive balance of CBDC-R in an individual's digital wallet would have had positive impacts and helped popularising it. Common people would have felt the urge to adopt the country's digital currency driven by benefits from earnings. However, this is already a widely debated issue and resolution is not being seen in the horizon soon.

Paragraph 4.5 of the aforesaid Concept Note of RBI's contains a table on the design features of CBDCs which are either operational or

under consideration in six countries/ geographical territory, viz., Bahama, Canada, China, ECCU, Sweden and Uruguay. The second column of this table titled 'Carry Interest or Not' states either 'No' for four countries and 'Not Decided' for two. It is therefore evident that none of the countries have concluded on the issue whether CBDC wallets will be considered as equivalent of an interest-bearing savings and/or fixed deposit accounts.

The first and foremost argument behind non-payment of interest is that no individual earns any interest for keeping paper currency notes in her/his personal possession. Neither a corporate entity gets interest for holding cash. The second argument is from the macro-economic perspective. Payment of interest on CBDC wallets is by itself a challenge for central banks of any country. Because decorating a CBDC wallet with all the attributes of a deposit account, instead of allowing it to remain only as chronicle of an individual's transactions and balance held, would potentially give rise to a situation of disintermediation in the banking and financial ecosystem of any country. This may cause flight of deposits from commercial banks to the central bank. This would also churn out the following further consequences:

- Commercial banks may lose a sizeable portion of funds from relatively cheaper sources like savings and fixed deposits form public going in favour of the central bank because going forward there would be no difference between existing fiat currency and CBDC in different forms,
- Shrinkage in supply of funds to commercial banks may lead to lower availability of money with them for lending which in turn would be detrimental to overall economic development.
- Banks would have to either increase interest rates on deposit accounts from public or borrow from expensive sources exposing them to operating with lower margin and larger financial risks of borrowing from external lenders.
- Banks also may have to hold larger volume of paper currency at branches to exchange against CBDC-R.
- One possible option to reduce larger concentration of CBDC-R in the wallet maintained by the central bank is to impose cap on holding digital currency by an individual. However, such a measure would be detrimental to popularising digital currency.

The author is of the view that such an important issue can be addressed after the pilot run is successfully over and both CBDC-R and CBDC-W are launched for all citizens and all financial institutions across the board. There is a need to study the experience of initial appreciation, approach, and financial behaviour of people in general on matters of CBDC-R, and how does that change once primary scepticisms are over. Going forward there would also be a need to study the extent of their adopting digital currency and emerging allocation between legacy fiat currency bank accounts and CBDC-R wallets. It would be relatively easy thereafter to take a decision with informed judgement regarding payment of interest on CBDC-R. Going forward, however, the target should be to convert the entire macro-financial and monetary ecosystem to CBDC-R and CBDC-W.

Conclusion

Readers might be thinking that this article has suddenly stopped like a short story. But for shortage of space this article would have continued. However, the author will feel happy if readers get from this piece a primary sketch of central bank digital currency. His efforts would continue to write more on the subject in coming months. MA

Bibliography and Webliography

All these websites have been accessed during December 2022.

1. *Paritosh Basu, Emergence of Central Bank Digital Currency from the Phoenix of Cryptocurrency, Digital Transformation - A Prismatic View, 1st Edition, April 2022, pp 144 - 156*
2. *https://explodingtopics.com/blog/number-of-cryptocurrencies*
3. *https://coinmarketcap.com/all/views/all/*
4. *https://www.investopedia.com/tech/what-happens-bitcoin-after-21-million-mined/*
5. *Sarika Murty, Vijay Victor and Maria Fekete-Farkas, Is Bitcoin a Safe Haven for Investors – A GACRH Volatility Analysis, Journal of Risk and Financial Management, July 2022. https://www.mdpi.com/1911-8074/15/7/317/htm#:~:text=Bitcoin%20rose%20to%2010%2C000%20USD,2021%2C%20setting%20a%20new%20record*
6. *https://www.imf.org/en/Publications/fandd/issues/2022/09/Picture-this-The-ascent-of-CBDCs*
7. *https://www.deloitte.com/content/dam/assets-shared/legacy/docs/perspectives/2022/gx-fsi-central-bank-digital-currencies.pdf*
8. *https://rbidocs.rbi.org.in/rdocs/PublicationReport/Pdfs/ ONCEPTNOTEACB531172E0B4DFC9A6E506C2C24FFB6.PDF*