ELSEVIER

Scopus

doi

Journal of Vibration Engineering

ISSN:1004-4523

Registered

- SCOPUS
- GOOGLE SCHOLAR
- DIGITAL OBJECT IDENTIFIER (DOI)
- IMPACT FACTOR 6.1

Our Website
www.jove.science

AReviewofBlockchainTechnology: CentralBankDigitalCurrency(CBDC)

MRS.SHIWANI SHARMA	MR. PARULPREETSINGH
RESEARCH SCHOLAR, BADDI UNIVERSITYOFEMERGINGSCIENCE AND TECHNOLOGY, BADDI 13sharma.shiwani@gmail.com	ASSISTANTPROFESSOR ,BADDI UNIVERSITYOFEMERGINGSCIENCE AND TECHNOLOGY, BADDI Parul.preet@baddiuniv.ac.in

Abstract-Adigitalrepresentationofanation'sfiatcurrencythatisissuedandsupportedby the central bank is known as Central Bank Digital Currency (CBDC). As various central banks have been working on creating their own digital currencies, the idea of CBDC has received a lot of interest. This review article gives a general overview of the CBDC idea, potential advantages and hazards of its use, and the status of CBDC projects globally at the moment.

Keywords – Digital Currency, Central Bank Digital Currency, Blockchain, centralization and decentralization.

I. Introduction

Blockchain

Blockchain is a distributed ledger system that enables safe and open data and digital asset storage and movement. It was first presented in 2008 as the core technology for the Digital Currency, but it has subsequently found use in a variety of other fields, including voting, supply chain management, and the financial and medical sectors.[1] A blockchain is fundamentallyadistributed,open,andtransparent databasethatismaintainedbyanetworkof computers, or nodes, as opposed to a single centralized organization. Every node in the network maintains a copy of the blockchain, and before being added to the ledger, each new transaction or piece of data that is added to the blockchain is verified by the wholenetwork.[1]Theblockchain'ssecurityandimmutabilityareensuredbythisvalidationprocess, which uses sophisticated mathematical algorithms and consensus procedures. The ability to conduct secure and transparent transactions without the aid of middlemen like banks or other financial organizations is one of the main advantages of blockchain technology.[2] More trust and responsibility between parties are possible results of this, along with faster, lessexpensive, and more efficient transactions. But, blockchain technology also has significant drawbacks and difficulties. For instance, some blockchain applications may not be scalable due to the high computational and energy requirements for blockchain validation. However, even though blockchain transactions are generally safer than conventional transactions, fraud and hacking are still possible. Ultimately, blockchain is an exciting technology with a wide rangeofpossibleuses andadvantages,butitiscrucialtoapproachitwith aclearawarenessof itsstrengthsandweaknessesaswellastakingthe uniquerequirementsand difficultiesofeach use case into account**.[**3]

Public, private, and consortium blockchains are the three most common varieties. Public blockchains, like those used by Ethereum, are accessible to everyone and do not require authorization to use. Since they are decentralized, no one organisation or entity has control overthenetwork.Allusershaveaccesstothecompleteledgerandanetworkofnodes

validates transactions on public blockchains. Anyone can upload transactions to the blockchain and take part in the consensus process. A single company or a collection of organizations has permission over and is in charge of private blockchains. These blockchains are frequently utilised for internal business operations or in sectors like healthcare or finance that demand a high level of anonymity. Only those who have been given permission can access the ledger and approve transactions in a private blockchain. A mix of public andprivate blockchains is known as a consortium blockchain. It is governed by a collection of businesses that collaborate to keep the network operational. Blockchain consortiums are frequently employed in sectors where several organizations must collaborate to operate a single database or ledger. There are further versions and fusions of these three primary blockchain types in addition to these three. Some blockchains, for instance, employ a hybrid method in which they merge public and private blockchains, or they use a private blockchain for the majority of transactions but sporadically log a summary of events on a public blockchain for transparency reasons. In the end, the particular needs and specifications of the application or business will determine the kind of blockchain that is utilized.[3]

CentralBankDigitalCurrency

The emergence of CBDC as a viable alternative to traditional cash is a result of the development of digital technology and the rising popularity of digital currencies. CBDC is comparable to a type of digital currency that a central bank issues and backs. Benefits including greater financial inclusion, reduced transaction costs, and improved security are possible outcomes. Yet, there are a number of dangers associated with its adoption, including the possibility of cyber attacks and money laundering. The growth of CBDCs has accelerated in recent years as nations investigate cutting-edge payment methods and virtual currencies.[4] The introduction of CBDCs is considered as a way to provide a digital alternative to conventional currency and round out the current payment infrastructure. When saved indigitalwalletsoraccounts,CBDCscanbeusedfortransactionsandpayments,includingpeer- to-peer(P2P)transactions,onlinepurchases,andin-storepurchases.Theycanbecreatedtobe used similarly to cash or traditional bank deposits. Retail and wholesale CBDCs are the two main types of CBDCs that can be issued. While wholesale CBDC is exclusively accessible to financial institutions for use in interbank payments and settlement, retail CBDC is open to the general public and can be used for everyday transactions.[5] In comparison to traditional currencies and payment methods, CBDCs may offer a number of benefits, such as increased financialinclusionforpeopleandenterpriseswithoutaccesstoconventionalbankingservices, decreased transaction costs and settlement times, and improved system efficiency. However, the introduction of CBDCs also presents a number of difficulties, including the possible effectsonthebankingsystem,privacyissues,therequirementforcyber security,andtheneed to guard against fraud. Thecreation and adoption ofCBDCs arebeing studied by a number of central banks throughout the world, including the People's Bank of China, the European Central Bank, and the US Federal Reserve. It will be interesting to watch how CBDCsdevelop and impact the global financial system in the years to come as their design and execution are still in their infancy.[7]

LITERATURE REVIEW

HistoryandOverviewofBlockchainTechnology

Thepaper"ASurveyonBlockchainTechnology:ItsUses,Benefits,and Limitations"byAlam et al. provides an overview of blockchain technology, its history, and its potential applications(2020). The authors explain the core principles of blockchain, such as decentralisation,immutability,andconsensus.Thepotentialbenefitsofblockchain,suchas

increased efficiency, security, and transparency, as well as its disadvantages, such as scalability, interoperability, and regulatory concerns, are also discussed. [8].

BlockchainTechnology UseCases

The author of the study "Blockchain Technology Applications: Many applications of blockchain technology are listed in "A Complete Evaluation" by Kshetri (2018). These comprise supply chain management, voting, identity management, healthcare, and payment systems. Additionally, the author investigates how blockchain technology may enhance each of these areas' security, transparency, and effectiveness. [9].

SupplyChainManagementandBlockchainTechnology

One application of blockchain technology being looked into is supply chain management.The study "Blockchain Technology in Supply Chain Management: A Review" by Singh et al. provides an overview of how blockchain might be used to increase transparency and efficiency in supply chains (2019). The authors discuss how supply chain management may benefit from blockchain technology in terms of greater confidence, decreased fraud, and improved traceability. [10].

MedicalBlockchainTechnology

Healthcare is another industry looking into blockchain technology. Blockchain can be used to improve security and privacy in the healthcare industry, according to the Mettler (2018) study"Blockchain Technology for Healthcare: Creating Trust in a Lack of Trust Setting. The author describes how using blockchain may be used to securely store patient data and enable safe data exchange between healthcare providers. [11].

DescriptionofCBDC

Barrdear and Kumhof (2016) introduce CBDC, discuss its potential drivers, and discuss its ramifications in their study "Central Bank Digital Currency: Motivations and Consequences." The authors claim that CBDC may provide benefits over conventional cash, such as increased productivity and decreased costs. Also, they discuss CBDC's potential risks and challenges, particularly how they may affect monetary policy and financial stability. [12].

DifferentCBDCs

The two forms of CBDC are retail and wholesale. Auer and Boehme (2018) analyse the differences between these two types of CBDC in their essay, "Central Bank Digital Currency and its Impact on the Financial System." Retail CBDC is meant for the general public and would be used for everyday transactions, but wholesale CBDC would only be available to financial institutions and be used for interbank transfers. [13].

MonetarypolicyandCBDC

One of the key reasons for concern is the potential influence of CBDC on monetary policy. According to Cecchetti and Schoenholtz, the authors of a 2018 paper titled "Central Bank Digital Currency: When Price and Bank Stability Conflict," CBDC may change the existing relationship between the central bank and commercial banks. They assert that CBDC could lead to disintermediation and make it more difficult for the central bank to uphold financial stability and control inflation. [14].

FinancialInclusionand CBDC

The CBDC may also have a big impact on financial inclusion. In the paper "Central Bank Digital Currency and Financial Inclusion" by Boar (2020), the author demonstrates how CBDC might help end financial exclusion by providing a low-cost, secure, and easily accessible method of digital payment. The author also discusses the potential risks and challenges of CBDC, including privacy concerns and the need for effective regulation.[15].

Cross-BorderPaymentsandCBDC

CBDCmightalterhowweconductinternationalbusiness.Inhisarticle,"CentralBankDigital Currencies and Cross-Border Payments: A Policy Proposal," Agisilaou (2019) provides a policy framework for the use of CBDC in cross-border payments. The author claims thatwhile CBDC may offer significant benefits such as quicker processing times, lower costs, and increased transparency, effective regulation and coordination are still needed. [16].

Title	Year	Author	Description
Research of a PossibilityofUsing BlockchainTechnology without Tokens to Protect BankingTransactions	2019	Natalia A. Popopva and Natalia G. Butakova	This studydescribestheuseofblockchain echnology without tokens to secure banking ransactional information. In a distributed database, they described four different failure ypes: transactional failure, node failure,mediafailure,andcommunicationline ailure. Hence, blockchain technology can be usedtosolvethedistributeddatabaseproblem without the need for miners. In this case, the bank would do any transaction's mining, and henew transactional block would be formed and joined to the blockchain. This paper also offers mining- and non-mining-based algorithms for creating blocks in ablockchain.
A systematic iteraturereviewof blockchainbased applications:Current status, classification andopenissues	2018	Fran Casino, Thomas K. DasaKlis andConstantinos Patsakis	Thisessayexaminestheuses,categories, and unresolved problems of blockchain. Explorationofblockchainapplications nfinance,integrityverification,IOT, healthcare, data distribution, and certification management. This report also acknowledges unresolved difficulties,includingtheapplicability of blockchain for industrial applications, scalability, sustainability of the blockchain protocol, interoperability, privacy and security solutions, and data management.
Blockchain application and outlook in the banking industry	2016	YeGuoandChenThe Liang	difficultiesindeployingblockchain n the financial sectors are highlighted in his study. It shows how some of the current top banking institutions are ooking into the matter. Although Blockchain is a totally decentralised system—as has already been mentioned—manysituationsneedfor

			some level of security, particularly when dealing with money. As a result, they have contrasted Public, Consortium, and Private blockchains. They suggest aarge number of financial organisationshat can build a consortium blockchain, which is the promising approach for the banking sector. They have alsosuggestedways in which this technology might be used to implement industry standards.
Exploration and Practice of Inter-bank Application BasedonBlockchain	2017	Tong Wu andXiuboLiang	This article demonstrates how blockchain technology may be used to register and record a variety of tangible and intangible items, including ntellectual property rights, images, property proofs, vote data, smart contracts, and more. Because they all demand an open and transparent nformationsource.Themaintopicof he paper is distributed databases, which havetheadvantagethatevenifoneor morenodesfail,thetransactionssaved ontheothernodesareunaffected,and he failed nodes can still back up data from the remaining nodes in thenetwork. They also show how untrusted parties might agree on a set of contract rules through the use of smart contracts. It also suggests a way to use blockchaino solve problems with conventional nterbank payments by establishing private blockchain networks in order to Transactions take less time and are less prone to risk.
Blockchain and its Application-A Detailed Survey	2017	Supriya ThakurArasandVrushalikulkarni	The ideaofanon-tokenizedschema, blockchain taxonomy, and hybrid methods totransformapermissionless blockchain into a permissioned blockchain are explained in this paper. With the Proof of Work (POW)protocol, each node in the network can brute-force its way to the solution of a cryptographic challenge. The winning node is then awarded with some money, which is subsequently broadcast across he network. The Proof of Stake (POS) system, which does not rely on a lot of processing, is essentially block verificationbyminersutilisingethereum

			andotheraltcoins.

Comparisonofcentralizedanddecentralizedcurrencies

A traditional currency system that is maintained and controlled by a single entity, usually a government or central bank, is referred to as centralized currency. The US dollar, Euro, Japanese Yen, and many more currencies are examples of centralized money. Contrarily, decentralized currency refers to a digital currency system that runs independently of any central authority.

Herearesomekeydifferencesbetweencentralizedanddecentralizedcurrencies:

A central authority that has the capacity to control the money supply and establish monetary policy is in charge of centrally managed currencies. On the other hand, decentralized currencies are managed by a network of users who jointly verify transactions and keep the blockchain up to date. Because every transaction is documented on a public blockchain, decentralized currencies are more transparent than centralized ones.[6] Users can follow their transactions and confirm the legitimacy of transactions more easily as a result. Because they employ cutting-edge encryption methods and are secured by a decentralized network of users, decentralized currencies are typically regarded as being more secure than centralized currencies. They are nevertheless still susceptible to hacking and other security hazards.When it comes to processing transactions, centralized currencies often process transactions more quickly than decentralized currencies. This is so that centralized currencies can supporta higher volume of transactions and have a more established infrastructure. While centralized currencies may need additional criteria like a bank account, decentralized currencies may be more available to anybody with an internet connection. Decentralized currencies are prone to valuechangesasaresult ofmarketdemand,whereas centralized currenciesaretypicallymore stable[6].

The choice between centralized and decentralized currencies will ultimately depend on the unique use case and the user's preferences. Both have advantages and cons. While decentralizedcurrencies arefrequentlyused forpeer-to-peertransactions,smartcontracts, and other applications that need security and transparency, centralized currencies are best suited for more common transactions like payments and investments. In the end, it's likely that the continuous growth of both centralized and decentralized monetary systems will boost innovation and broaden access to finance for individuals all around the world.

Conclusion

To sum up, blockchain technology and Central Bank digital currency (CBDC) are two innovative fields that are interconnected and have the potential to change not only thefinancial sector but also other industries. In both situations, a collaborative and multi-stakeholderstrategythattakesintoaccountthedemandsandconcernsofvariousstakeholders,

including users, regulators, and financial institutions, will be necessary for the successful adoption of blockchain technology and CBDCs. To solve the difficulties and constraints andto realise the full potential of these advances, additional research and development are also required. In general, CBDCs and blockchain technology are fascinating new areas of innovation with the potential to significantly alter the financial industry and other industries. While there are difficulties and dangers, there are also substantial opportunities and advantages, and these technologies appear to have a bright future. Through the provision of a safe and effective substitute for conventional cash, CBDC has the potential to completely reshape the financial landscape. Nonetheless, the dangers associated with its implementation mustbecarefullyconsideredbycentralbanksbeforebeginningtheirownCBDCoperations.

The current condition of CBDC initiatives worldwide reveals that this field is fast evolving,and it is still unclear how this will affect the financial sector.

References:

[1]IEEEpaper4.pdfProceedingsoftheInternational ConferenceonMainstreamingBlockChain Implementation (ICOMBI) 2020 978-93-5406-901-7 © 2020 IEEE
[2]BlockchainTechnologyanditsApplicationsAcrossMultipleDomains:ASurveyISSN:1941- 6679
[3]Blockchain–Literature Survey20172ndIEEEInternationalConferenceOnRecentTrendsin Electronics Information & Communication Technology (RTEICT)
[4]What IsaCentralBank DigitalCurrency(CBDC)?(investopedia.com)
[5]Atlantic Council. "Central Bank Digital Currency Tracker. https://www.atlanticcouncil.org/cbdctracker/
[6]https://digital currencymagazine.com/articles/digital currency-truly-decentralized-yes-important-1421967133/
[7] blockchainbasedCBDCIEEEpaper.pdf
[8]ASurveyonBlockchain Technology:ItsApplications,Advantages,andChallenges"byAlam et al. (2020).
[9]BlockchainTechnologyApplications:AComprehensiveAssessmentbyKshetri(2018).
[10]BlockchainTechnologyin SupplyChainManagement: AReview"by Singhetal. (2019).
[11]AstudyOn"BlockchainTechnologyfor Healthcare,ByMettler (2018).
[12]CentralBankDigitalCurrency:MotivationsandConsequences,ByBarrdearandKumhof(2016).
[13]Central Bank Digital Currency and its Effect on the Financial System, by Auer and Boehme(2018)
[14]CentralBankDigitalCurrency:WhenPriceandBankStabilityClashbyCecchettiandSchoenholtz(2018).
[15]CentralBankDigitalCurrencyand Financial Inclusion"byBoar(2020)
[16]CentralBankDigitalCurrenciesandCross-BorderPayments:APolicyProposal.",by Agisilaou (2019).