Cryptocurrency Integration Challenges in Blockchain for Financial Institution

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Abstract— Cryptocurrency is the latest adventure of currencies that works by using the new edge technology called the blockchain. It has gained the notable attention of the people for the last several years across the world. Cryptocurrency is also globally known as digital currency or virtual currency, and it is a form of payment that can be used online for goods and services. Blockchain has captured the application of many in the financial industry, including those vigorous in the transaction, clearing, and settlement, with its promise of greater efficiency and higher resiliency. The Cryptocurrency has been adopted by using blockchain technology that raised eye-catching attention in the financial sector, government, stakeholders, and individuals as well. It can be anticipated that Cryptocurrency will be the future currency that will replace fiat money worldwide. Though it has been attracted the users' attention, the money of them worried about its future useability, drawbacks, and challenges. Still, the research on cryptocurrencies is far behind and in the initial stage to integrate these currencies in financial institutes. This lack of trust situation in the financial sector aggravates further when it comes to cryptocurrency management challenges that are still not critically analyzed. The originality of this paper is the concept of currencies including cryptocurrencies, the concept of the blockchain ecosystem, and the cryptocurrency integration challenges of the existing blockchain in the financial institution. This paper will help the new researchers to work on cryptocurrencies and their integration challenges in the financial system.

Keywords: *Cryptocurrency, Blockchain, Hash, consensus, immutability*

1. INTRODUCTION

The use of Cryptocurrency put forward valuable opportunities for financial institutes, where people are looking for modern version technological solutions to rebuild trust and confidence across the globe. A good number of technologists believe that financial transactions can be made more efficient and faster between senders and receivers by using cryptocurrencies. The first Cryptocurrency is called "Bitcoin" was introduced in 2009, was using the pseudonym Satoshi Nakamoto published a paper and suggested a peer-to-peer network (P-to-P) solution for online fund transfer from one party to another without intermediatory help [1].

Global Financial turmoil was the time where people lost their confidence in the financial system, and at the same time, they were looking for the best alternative for investment that could ensure security and accountability. Cryptocurrency is a type of digital currency which is mined by Blockchain technology. The distributed ledger is used for cryptocurrency transactions which is an immutable ledger for transferring the ownership, keeping transactions records in different nodes, tracing assets, ensure transparency, trust, and security [2]. Moreover, financial institutes always try to prevent security incidents and financial losses. Cryptocurrency is one of the latest innovations of the 21st century which creates a wave from financial industries to manufacturing companies [3]. A substantial positive change in the financial institutes is possible by using Cryptocurrency as well as other sectors like supply chain, medical treatment, insurance, and other industries [4]. Recently, a significant number of investors have become more interested in investing their money in Cryptocurrency for making more profit which is increasing day by day to other customers as well. In this paper, some of the majors' cryptocurrency challenges in financial institutes are discussed like scalability, regulatory policy, AML policy, and so on.

The remaining of this paper has been arranged in the following sections. A brief history of the currencies, including cryptocurrencies, is described in section 2. The concept of the blockchain ecosystem is in section 3. Then the integration challenges of cryptocurrencies in financial sectors in section 4. Finally, the paper is concluded with a discussion in section 5.

2. HISTORY OF CURRENCY

Before beginning history, the concept for the creation of money was taken place as one of the forms of (i) medium of exchange value, (ii) A unit of account, and (iii) a store of value. There are few steps for the development of money in history.

2.1 Barter System

The barter system is an old method to exchange goods and services. This system was used for centuries before inventing money. From the beginning of using money, people used the Barter System. A barter system has been used for centuries and before money was invented. The payment methods were created lots of problems and repercussions among the payees and receivers in the society in terms of an unequal measurement system [5].

2.2 Commodity Money

When people did not agree upon with the measurement and valuation of goods in the barter system, there was another system called the commodity money approached was introduced. Commodity money means a physical good that has an intrinsic value that was used as money. For examples include salts, copper, gold, silvers, cocoa beans, etc. As per the specification of this money, it has four characteristics, i.e., durability, divisible, easily exchangeable, and rare. Commodity money was used as the medium of exchange the money and as for payment. But it is not convenient and easy to carry the goods elsewhere [6].

2.3 Metallic Money

Metallic money is also a type of money that was issued by the central bank of the respective countries in the form of metal, and it was the legal tender money in the economy. It was made of gold and silver and people have used this money as a medium of exchange [7]. Metallic money was continued for a long period and the following steps were involved.

i)   Initially, People used this metallic(gold and silver) money as a medium of exchange for several purposes, but there was no specification of this coin, and the value was measured based on the weight.
ii) After a long period, there was a proper coin system was invented against gold and silver, and the face value of these coins was measured by using the real value of gold and silver.
iii) However, the metallic money system was used for a longer period, where bimetallic coin systems were adopted, and both the coins were used simultaneously.
iv) The major challenges were raised to store the gold and silver coins from theft. Therefore, people found a new way to solve this problem and they stored these gold and silver coins to the jewelry dealers for safeguarding the same. On the other hand, the jewelry was started to keep the coins and gave the receipts against these coins, and the system became popular where the people started to exchange the receipts themselves instead of real coins.
v)   The acceptability of these receipts for making the payment of goods and services among the people gave a new popular concept of community-backed. Banks capitalized on this new concept and started to issue the receipts in the form of that were ensured by gold.

2.4 Fiat money

In 1971, the president of the United States, Nixson raised the issues to the economic forum and gave the instruction to issue a series of temporary economic measures, He also instructed to cancel the direct convertibility of US dollars into gold and the convertibility process from fiat money to gold was stopped [8]. Therefore, the gold-backed money was replaced by non-convertible fiat money. Central banks legalized the paper money and started printing the different denominations, and they also circulated legal tender laws that people were bounded to accept the non-convertible fiat money.

2.5 Cryptocurrency

Nowadays, Cryptocurrency or digital money has become popular after blockchain and distributed ledger technology were added to the payment network. The system depends on the blockchain payment network where the technological infrastructure setup is essential to manage the payment gateway that may help to avoid multiple payments.

On the other hand, by using Cryptocurrency, individuals can do one-to-one or peer-to-peer transactions freely, allowing society to control the value of the Cryptocurrency. To maintain the Cryptocurrency, a distributed database system is required to maintain the distributed ledger into the network by using highly encrypted technology, which helps to manipulate or change the original data or information in the blockchain network. The Cryptocurrency has been developed through using blockchain applications that may provide a secure and immutable platform, and at the same time, all the transactions are recorded into every node or computer as a digital medium called Cryptocurrency.

The word crypto means encryption, and the Cryptocurrency or instrument is maintained by a distributed ledger through though using the blockchain application platform. The currency is here as a medium of exchange. It is also called virtual currency. The first Cryptocurrency is "Bitcoin" which was introduced by the pseudonym Satoshi Nakamoto in 2008, and this currency is maintained by users through a crypto wallet.

2.5.1 Bitcoin

A person or group of people in 2008, was using the pseudonym Satoshi Nakamoto published a paper and introduced a new cryptocurrency is called "bitcoin" and suggested a peer-to-peer network (P-to-P) solution for online fund transfer from one party to another without any third or trusted party [1].

Bitcoin is a virtual currency and there is no central authority of issuing the same, and it does not have any physical form to store. As per the design of Bitcoin, 21 million bitcoins generation is possible by solving complex mathematical algorithms, and the bitcoins will store cryptographically into the distributed ledger.

Characteristics of Bitcoin:
- Decentralize: Does not have any central authority to control or mining it, so it is completely out of control of Government authority.
- Faster payment process: Payment can be made digitally by using Cryptocurrency or bitcoin platform at any time, i.e., 24/7.
- Account or currency holders anonymous: All transactions of bitcoins are happening publicly, but still, it is anonymous and does not have any physical cash.

3. THE CONCEPT OF BLOCKCHAIN ECOSYSTEM

3.1 Blockchain

Blockchain is a technology that represents the data as a chain of blocks, allows transactions to be gathered into blocks, it is an immutable time-stamped series record of data that is distributed, and formed the chain blocks cryptographically in chronological order and permits the resulting ledger to be accessed by different servers [9]. It is not only a single technique, and it has some other important features like cryptography, complex mathematical game theory, algorithms, peer-to-peer networks, and distributed consensus algorithms that may solve the complex synchronization problem [10], [11]. Blockchain and Digital Ledger Technology (DLT) are used for the same purpose. Blockchain is a type of DLT [12]. A distributed database structure is used for blockchain technology to store all identical copies of auditable, latest, and decentralized transaction or data. The key features of Blockchain Technology are below.

i) Decentralized

Blockchain does not depend on the centralized database system, all data are stored in different notes or computers in distributed. Decentralization of database is a new concept; it is referred to as the transfer process of control and decision-making system from centralized to distributed system in blockchain through which greater and fairer services can be achieved [13].

ii) Distributed Ledger

Distributed Ledger Technology (DLT) refers to the digital system where all the records are connected or related to assets, and all the transactions or records are simultaneously located in different numerical locations [16]. Presently, in most cases, cryptocurrencies are used for the DLT system, where decentralized distributed ledger technology verify the transactions into the blockchain network. At least one or more copies of the ledger are maintained in the nodes. When the data is added to the ledger, all nodes receive identical copies of the updated ledger. DL is a very resilient system to prevent the single point failure of any node or compromise any single node by cyber-security threats, and it has an exceptional track record for assets and values across the industries [14].

iii) Immutability

Immutability is the ability of the blockchain technology to keep the data or records unchanged in the blockchain, which cannot alter, and each block of the transaction details proceed with a cryptographic hashing algorithm [15]. On the other hand, it can only change if someone or a group of people can take 51% control over the nodes at the same time [16].

iv) Enhanced Security

One of the key features of blockchain technology is a highly secured platform and all the transactions are recorded in the block by using the private and public key by a cryptographic hashing algorithm. No one can simply change the data into the block, which is ensured by encryption mechanism, and the cryptography layer is another type of protection of the data for users.

v) Consensus

For synchronization of distributed ledger, there is a mechanism for using a different number of protocols for communication between participants or nodes and for providing consensus among nodes for the current state of the ledger and historical ledgers as well. It is the fault-tolerance mechanism that is used for the blockchain network to achieve the necessary agreement to use a single data of the network among distributed systems.

vi) Faster Settlement

Direct payment method is used in blockchain network between buyer and seller where third-party involvement is not required. Presently, most of the banks are using third-party SWIFT for settlement the transactions which are less secured as well as time-consuming. On the other hand, Participants on a blockchain network can make the transaction which is visible and settle between parties in minutes or even seconds rather than days [17].

3.2 Blockchain Structure

Decentralization, accountability, and security is the core characteristic of blockchain technology. The structure of blockchain and its components and interaction, namely peer-to-peer network, properties of block and genesis block, transaction in ledger, validation process, consensus mechanism, and proof-of-work. Generally, blocks contain the data, previous block hash, current block hash, timestamp, and other information [18]. Figure 1 shows the structure of blockchain.

i) Data

Block is the form to store the data. It is very useful when we know the number of data elements and how large the data element will be [19]. It depends on the purpose of the use of a blockchain network. For example, the transaction record for clearing and settlement in the bank, IOT data, etc.

ii) Hash

When a transaction occurs in the blockchain network, it should be hashed with code and broadcast the message to all nodes in the participants' network. It is capable of holding and maintaining thousands of transactional records in a single block, and the Merkle function is used to generate the hash value in the blockchain application, which is called the Merkle tree root. The cryptographic hash function is used for security purposes, and it generates a fixed-length character string from random input data records in blockchain [20]. Finally, the

hash value is recorded in the blockhead of the current block through the Merkle tree function, and the computer resources will be reduced significantly.

iii) Timestamp

The timestamp is generated into the block of the blockchain network. It creates a breakthrough in blockchain notarization and its fellow works like digital signature, authentication, etc. where any data is timestamped [21].
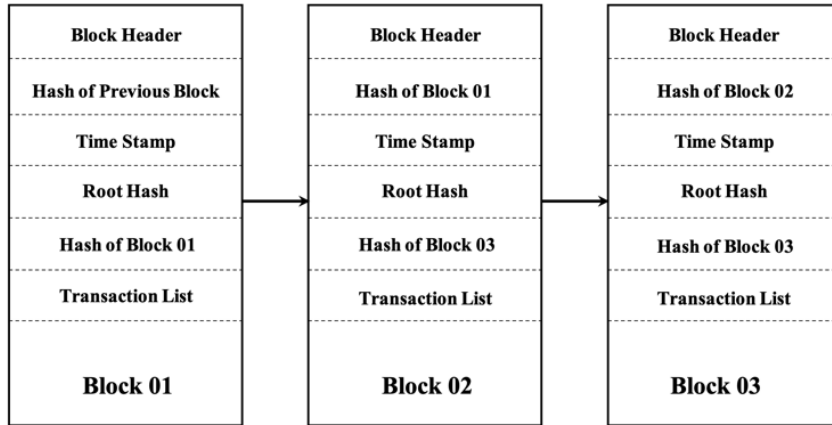

Fig 1. Blockchain Structure.

3.3 Comparison between Fiat money and Cryptocurrency Transaction

Fiat Money Transaction process:

Figure 2 showing the traditional banking transactions process with comparison to Cryptocurrency (digital currency) based transactions in the banking system. The process will start to send the money from user A (sender of the transaction) to user B (Receiver of the transaction). The system uses the traditional centralized banking
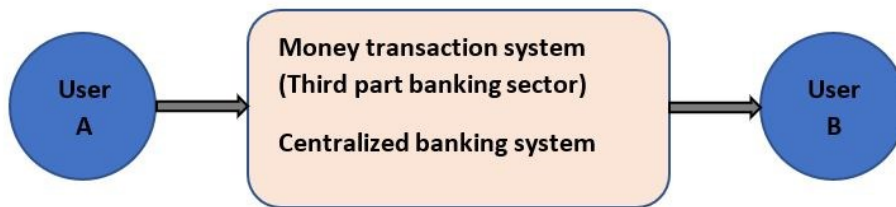

Fig. 2. Fiat Money Transaction process.

the system is controlled by the bank itself, and the major concern is security that is also controlled or maintained by the bank. In most cases, the central bank has the right to issues coins and banknotes, which is called fiat money, and the currency-produced policy depends on the monetary policy. The exchange rate is also controlled by the central bank of the specific country.

Cryptocurrency Transaction Process

Figure 3: showing the cryptocurrency transaction procedure. User A (Sender) can transfer the money to user B (Receiver).

The transaction should be bound into the blockchain network among the users. The node in the blockchain network keeps the transactions record with date and time, the previous block has value, text, and the next hash for the next blockchain. For making the transactions, blockchain technology uses the distributed ledger and all the transactions are validated by the users or node, and the same will be done through using private and public keys mechanisms. No doubt, Cryptocurrency is easier to use than fiat money and the fund transfer process is done within few seconds between the sender and receiver. For doing the transactions, the third part requirement is not required, and the currency values are maintained by digital application software.

3.4 Proof of Work (PoW)

Proof of Work (PoW) is one of the vital consensus mechanisms that is widely used in the blockchain which was popularized by Bitcoin [22]. It is like a piece of data and very hard to produce the proof of work but easy to verify for others and fulfil the requirements. The main consensus algorithm is PoW that is used to confirm the transaction and generate the new blocks in the chain, and miners compete with each other to complete the transaction in the network for rewarding [23]. Senders and receivers are required to the digital tokens among themselves where the transactions are stored in the blocks. The proof of work consensus algorithm solves the complex mathematical puzzle to create the new blocks into the Bitcoin blockchain network; the process is called mining and the computers that engage in mining are called miners [24].
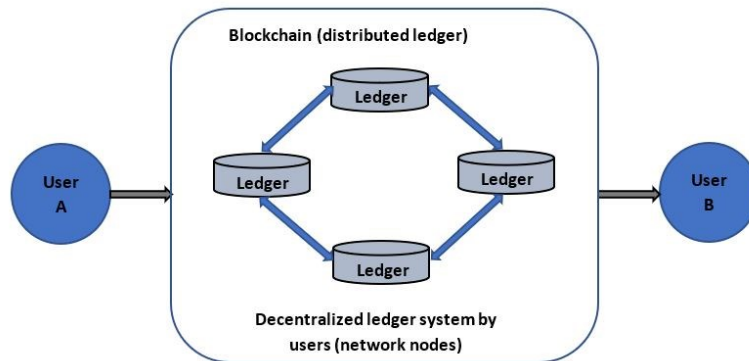

Fig. 3. Cryptocurrency Transaction Process.

3.5 Proof of Stake (PoS)

Proof of Stake express that a user can mine or validate transaction in the blockchain network according to his or her holding of coins, and it is created as an alternative of PoW. Proof of Work always consumes huge electric power. On the other hand, less computing power is required for proof of stake. The important features of Proof of Stake are as follows [25].

- Energy savings – less computing power is used for mining blocks.
- Reduced hardware requirements – comparatively low hardware configuration is needed to generate the blocks.
- Strong immunity – insist cryptocurrency Integration Challenges in Financial Institute.

4. CRYPTOCURRENCY INTEGRATION CHALLENGES

A few years before, when moved from many ledgers systems to a single ledger (i.e., all the transactions associated with reconciliation, central clearing parties, auditing, etc.) system in financial sectors, the huge challenges we faced to do the same. But now whole banking industries in the world are using the same or unique system. To design any Core Banking System (CBS) of today, we need to keep in mind the security concern, robustness, confidentiality, integrity, and availability as well. But the flexibilities are not enough in how they communicate with other technologies.

In the last couple of years, there has been a significant amount of hype behind the potential use of Cryptocurrency for financial institutes. The reason for this hype is a cryptocurrency that allows us to redesign the financial system. Currently, five major cryptocurrency integration challenges for the financial system are discussing below.

4.1. Cryptocurrency Governance

Cryptocurrency governance is one of the main policy-making governing body and they can also form and implement the Information Governance Framework(IGF) in the financial institutes. It brings apparent benefits such as reducing the transactional cost, minimize legal issues, and improved network performance. The metamorphosis of the financial sector is to expedite the use of ICT-enabled services for clients. Today, it is quite impossible to think about financial services without IT-enabled applications. Cryptocurrency, blockchain, and distributed ledger are the latest technology that may use for the financial system. It will also help to increase

accountability, data privacy, trust between the users, and improve the transparency that will help to build the ITC functions. It has also the ability to support building the strategic planning for the financial institutes and delivery the value. The following guidelines need to be addressed before the integration of Cryptocurrency in financial institutes.

- Strategic Policy Alignment: The strategic policy guidelines will ensure the alignment as well as the involvement of the stakeholders with financial institutes that will align the business goal as well ensure the appropriate use of the technology.
- Value Delivery: It will ensure and certify that the Cryptocurrency system in blockchain for the financial system will deliver the products as per customers' needs.
- Performance Delivery: Business may obtain value from Cryptocurrency that need be quantified for the investment.
- Risk Management: A separate cryptocurrency governance model can be implemented to evaluate the risk management system which is one of the most important pillars of IT governance.

4.2. Non-Scalability

Cryptocurrency is moned and used by blockchain applications where the Blockchain is application is used the distributed ledger system to maintain participants' transactional history in each node of the computer network. For comparison purposes, VISA processes 1,700 transactions per second whereas the blockchain can process around 4.6 transactions per second on average. So, the adoption of Cryptocurrency in the financial will be a global challenge [26].

Nowadays, the popularity of Cryptocurrency has been increased tremendously along with other IT-enabled services in the financial sector, the scalability problem has become more apparent especially in the financial system. Although there are significant methods that have been suggested, still the limitations exist with each of them. The most notable challenge is known as "Sharing Database". However, for mining and using Cryptocurrency, the use of blockchain applications is essential. To develop the blockchain application, database sharing is required to share and store the transactional data into the nodes where the storage system keeps the records across the Peer-to-Peer (P2P) network.

The major challenge of sharing the database is the prime concern of security issues in the blockchain payment network system which provides additional complexity for the blockchain application developers who may need to add extra level communication protocol.

4.3 Regulatory Policy

All the financial institutions all over the world running under the supervision of their respective Central Bank. But there is a major lacking especially for the Cryptocurrency or digital currency transactions that no central authority is available to make the transaction i.e., no central bank policy available for the same. Until a proper regulatory framework is established, it is not possible to use digital currency to make the payment through a banking channel.

4.4 Anti Money Laundering policy formulation

Money Laundering (ML) is one of the major threats for the financial institute by affecting the economical stability of the nations. No financial institute is immune from money laundering risks. Most of the financial institutes in the world are using Anti Money Laundering (AML) software but still money launderers applying different mechanisms to send illegal money. Till there is no central authority to control the Cryptocurrency and it is mined by a few people of group and the total controlling power on their hand that will provide a huge opportunity to the money launderers to send and receive the illegal money. There is no AML system is using for Cryptocurrency (Bitcoin, Litecoin, Ethereum, etc.) transactions. Financial institutes should be integrated with their core financial system before making cryptocurrency transactions and the AML system should be capable to detect suspicious transaction reporting, cash transaction reporting, identification of PEP, usual transaction reporting, etc.

4.5 Cybersecurity threats

Nowadays, the financial industry is facing various types of cyber threats which intend to exploit the vulnerabilities of the system, interrupt the system, and finally steal the fund and data. Cyber-attacks are being

frequently changed in the sense of sophistication and their occurrence is gaining momentum. In recent years, a significant number of high-profile cyber-attacks compromised the banking system and ultimately customers lost their funds and data. Some of the cyber-attacks frequently faced in the banking industry are as follows:

- Distributed Denial of Service (DDoS) attacks.
- Man-in-the-middle attacks.
- Ransomware attacks.
- Malware attacks.
- On process attacks.

5. CONCLUSION

In recent years, Cryptocurrency has become one of the greatest adventures in the field of currency due to its physical cashless nature. All financial institutions can play a key role in international cross-border payment by using Cryptocurrency or digital currency through the blockchain network. It will save the cost, settlement time, and avoid double-spending and third-party involvement. However, Cryptocurrency is the latest technology-based digital currency that can use for financial systems, but still, it has some integration challenges with the financial system which have been highlighted in the article.

We hope that soon we can see the use of Cryptocurrency, especially in the financial sectors through blockchain applications with a safe and supportive environment. On the other hand, for years and years, we have seen that there is a gap among the Government bodies, regulators, enterprises, and people that is one of the main challenges for cryptocurrency integration in the financial industry. The utilization of Cryptocurrency in the Finance system acts as part of difficulties as well as it investigates various chances. This Cryptocurrency can give a lift to new systems as it is straightforward, open, and simple to utilize. Though some significant achievements have already been adopted by using Cryptocurrency in the blockchain system, still, the regulators, government bodies, and financial institutes need to be addressed before the integration of Cryptocurrency in the financial system.

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