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The Importance and Use of Blockchain Technology in International Payment Methods

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Abstract: Blockchain technology, which has entered our lives in recent years, constitutes one of the most remarkable issues of the 21st century. According to Merriam Webster, blockchain is defined as; "It is a database with information shared in a digital network that is decentralized and accessible to all stakeholders and can be used at any time". Looking at this definition, we can clearly understand that blockchain technology is actually a way to store certain information. Today, it can be seen that rapid technological developments in cryptocurrency techniques are an effective measure against security vulnerabilities such as hacking and theft encountered in the realization of fund transfers. The reason behind this is that the underlying blockchain technology of cryptocurrencies filters out duplicate and incorrect transactions. The emergence of cryptocurrencies as a payment system along with these conveniences has brought debates in traditional financial transaction markets. This means that conventional financial institutions face risks and threats from the popularity and effectiveness of cryptocurrencies. Today, when we look at it, we see the state or state structures – such as Central Banks – that guarantee the reliability of currencies in traditional currencies. The most important feature of the digital currency is that it does not have this central structure and does not have any authority to affect the currency.

Keywords: Blockchain technology, International payment methods, Digital currency

Introduction

With the emergence of the digital world, the way of life of people all over the world has changed. The digital world has contributed to the reshaping of many different fields such as economy and politics. We see a clear example of this in cryptocurrencies, a virtual money model that emerged alongside traditional currencies, which have become an important alternative for the financial system.

Blockchain technology, which has entered our lives in recent years, constitutes one of the most remarkable issues of the 21st century. According to Merriam Webster, blockchain is defined as; "It is a database with information shared in a digital network that is decentralized and accessible to all stakeholders and can be used at any time". Looking at this definition, we can clearly understand that blockchain technology is actually a way to store certain information.

It is important to understand why such a technology is needed and what are the reasons behind it. A more detailed description of blockchain technology will be given in the following sections. The purpose of making a more detailed definition of this concept is to explain the concept better. After the definition is made, it will be stated in which areas the blockchain technology can be used. It will be explained with examples from different sectors such as finance, government, insurance, health and tourism sectors, including both B2B and B2C international trade.
Cryptocurrencies are referred to as the "wild west" in financial systems as they have moved beyond the contemporary boundaries of the 22nd century. They are appeared as an alternative way at financial system and a risk to the traditional finance service providers currently available. First of all, to give an example of one of the advantages of cryptocurrencies, these systems allow faster and more cost-effective transfers of funds in global trade bypassing traditional financial intermediaries such as banks. Today, it can be seen that rapid technological developments in cryptocurrency techniques are an effective measure against security vulnerabilities such as hacking and theft encountered in the realization of fund transfers. The reason behind this is that the underlying blockchain technology of cryptocurrencies filters out duplicate and incorrect transactions. The emergence of cryptocurrencies as a payment system along with these conveniences has brought debates in traditional financial transaction markets. This means that conventional financial institutions face risks and threats from the popularity and effectiveness of cryptocurrencies.

In addition to the above-mentioned advantages, the complexity of the crypto currency model as a new virtual currency has an impact on the exchange of goods and services. Unlike other traditional currencies, this system is a simple decentralized electronic currency that is not controlled by governments or banks. The lack of a centralized structure causes a decrease in confidence in this currency. Today, when we look at it, we see the state or state structures – such as Central Banks – that guarantee the reliability of currencies in traditional currencies. The most important feature of the digital currency is that it does not have this central structure and does not have any authority to affect the currency.

Technology behind Blockchain

As the name suggests, blockchain technology is a chain of blocks and this means virtual meaning. In the definition made by Gupta (2017), blockchain is expressed in its most stable form: "It is a shared and distributed ledger that facilitates the process of recording transactions and tracking assets in a business network". However, today, thanks to technological developments, blockchain is no longer used only in computer sciences, but also in the business world. Blockchain technology has become a useful mechanism for businesses due to its peer-to-peer decentralized network structure, distributed database, consensus mechanism, advanced cryptographic systems and immutability. For example, with this developing technology, the way strategists see cost and benefit analyses and how they establish a business relationship has also changed. The more inclusive definition of Gupta can be said as follows; "Deeply, a peer-to-peer distributed ledger which is cryptographically secure, immutable or hard to change, append-only, and can just be updated through peer-to-peer consensus or agreement is called as blockchain" (Bashir, 2017). Figure 1 is important to better understand the idea of how blockchain contributes to our lives by seeing the difference between centralized, decentralized and distributed networks.

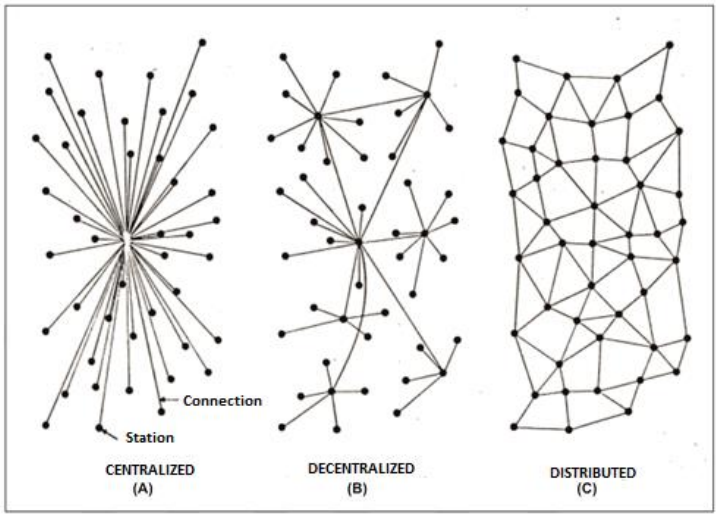

Figure 1. Network Types
Source: Baran, 1964.

Thanks to the blockchain technology, the risks in the vulnerable nature of central networks are minimized, and for this reason, it is observed that there is a shift towards distributed networks. Baran (1964) explains this problem by saying, "The central network has a weak structure. This is because destroying the single central node will completely cut off communication between the end stations." As can be seen in Figure 1, it could be said that such problem is looking partially to be solved. This is because all end stations are taking all data in distributed systems based on blockchain. A copy of the approved information is kept at each end station and it is extremely difficult to want to change this information. In the following headings, the details of this technology will be elaborated and examples of its application areas will be presented.

Basics Knowledge about Blockchain

In the article of Satoshi Nakamoto and his group for Bitcoin, this technology was mentioned for the first time and blockchain was used as a synonymous term with Bitcoin in the early days. The dramatic rise of Bitcoin from the earliest times to the present has caused the blockchain technology to remain in the background. When we look at it today, it will be seen that Bitcoin is a product formed based on blockchain technology thanks to some other technologies. Thanks to using of Bitcoin at business world, blockchain has reputation and recognition at business world too. At this point, Bitcoin has acted as a catalyst. It can be said that Bitcoin is a new payment method

supported by different technologies. When this technology first hit the market in 2008, it was starting to be famous especially in the financial sector. However, when digital currency system is taking into account, Bitcoin was not the first attempt. The first examples of electronic money are also seen in the 1980s. It is David Chaum who proposed the terms of digital cash and blind signature. He talks about this in his article "Blind Signatures for Untraceable Payments". At the beginning of 1990s, Chaum founded DigiCash as electronic money. It is seen that the first transaction with DigiCash was made in 1994. Although a few attempts were made for electronic currency after DigiCash, it seems that the system remained in the background until 2009. The developments in the electronic money had almost no progress till the end of 2010s. The genesis block which has a meaning of "the first block in the Bitcoin blockchain network" was created and mined by Nakamoto in 2009 (Gates, 2017).

Such development was the milestone at banking sector and how payment transactions could be done. In 2008, Mortgage Crisis has been blowed. Such crisis was a message to all people. People at business sector realized the weaknesses and problems of the existing payment methods. During this period, the decrease in trust in banks and other central institutions caused Bitcoin to fill this trust gap. Bitcoin's anonymity, ease, security and fast transaction have attracted the attention of users. In this system, users do not need intermediaries and do not have to go through the bureaucratic processes required by intermediary institutions for a transaction.

While the first stage of the blockchain network was the use of Bitcoin for payment systems, the network began to evolve as new uses of the network such as smart contracts were discovered. During this period, the second phase emerged, where Ethereum, another payment structure, focused on smart contracts and decentralized autonomous organizations. The third stage of the blockchain is Factom, which emerged as a blockchain-based broadcast network. It is connecting itself to the Bitcoin or Ethereum networks by providing a smaller and more scalable network of federated nodes (Laurence, 2017).

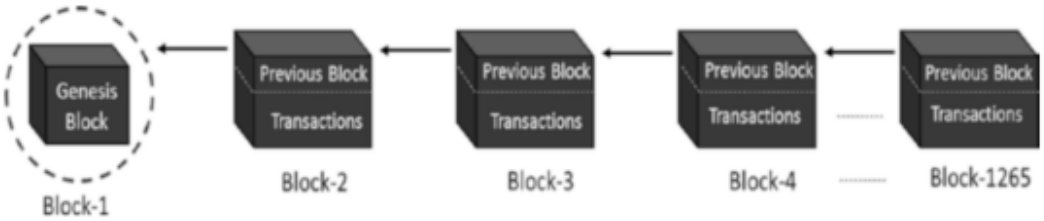

Figure 2. The Structure of Blockchain Works
Source: Singhal, Dhameia and Panda, 2018

By looking Figure 2, it could be seen how blockchain system is structured. It is understandable that the process starts with the first block called genesis and then consists of data blocks. These data blocks are blocks that are chained together after predetermined rules are applied. Each new block has the summarized data/knowledge of the previous one. Created new one adds new data/knowledge to the chain. This process includes hashing and validating all nodes in the network. Figure 3 and Figure 4 are presented as an example to show how transaction process is going on in a system. There are four different parties under transaction. They will be called as Alice, Bob, Charlie and Dave. In the example they will do payment transaction with other party. At blockchain system, such parties are called as "nodes". When each payment transaction is done new block is created. All nodes get info about new created block and record the data. When this transaction is doing everyone can monitor the transaction history whenever nodes want.

Figure 3. The Beginning of Payment Transaction
Source: Singhal, Dhameia and Panda, 2018

From the Figure 3, it could be seen that Alice$50. This is the first step of the transaction. As explained before, such chain is recorded as the genesis block- first block at chain. All parties at the system have the same copy simultaneously.

Figure 4. Second Step at Payment Transaction
Source: Singhal, Dhameia and Panda, 2018

It is seen that Alice pays $20 to Bob and starts payment process. By doing this, new block is created on the chain showing in Figure 4. It is seen that this operation is recorded as an immutable data in the ledger of each node. All nodes of the chain monitor, verify and then record a copy of the transaction. This process continues in this way as new transactions are made cyclically. Unlike traditional record keeping methods, at blockchain system, any transaction is recorded constantly whenever a transaction is performed and whatever happened. Thanks to this characteristic, the system is working as synchronized and it prevents cheatable activities caused by repetition. There are also advantages of networking, such as getting rid of transactional environments and reducing the time spent in processing. It will also appear that validation concerns disappear as the data is validated by all participants or nodes. As a result, blockchain distinguishes itself with its consensus-based mechanism, immutable data structure, resource capability and a synchronized ledger (Gupta, 2017).

Terminology of Blockchain Technology

Up to this stage, it has been seen that thanks to the developments in technology, data has been enabled to be copied and distributed over a network where borders have been lifted around the world. With Distributed Ledger Technology, everyone in the network has a copy of the same information. However, it is also a fact that the old version of this technology lacked the security of data shared within the network. At the beginning of blockchain technology, what was sent to the system was encrypted information and only the data owner could make sense of it. Encryption alone was not enough for the network, as any changes in the data could not be updated on the network. For this reason, it was necessary to develop a structure that included every participant in the network through a consensus mechanism provided in the system. With the help of consensus mechanism and encryption, safe and valid recording of data in the system is ensured. Thanks to the technology that includes all these features, all nodes have his/her own encryption, the same data copy which is accepted and verified by the system, and the blockchain that enables data distribution over the network with various permission options. All technological terminology related to the blockchain can be accessed under the following subheadings (Usta and Doğantekin, 2017).

a. Cryptography; This technology is the main enabling technology for the blockchain. However, this technology should not be seen as a new technology among encryption methods. For example, Julius Caesar was one of the first to use encryption when he needed privacy in his messages. The system that he used at his message was called the Caesar Cipher. Such method was one of the popular and useful encryption technique at his time. The information to be shared in this system included only the change and hashing of letters and numbers, which allowed the owner of the password to decrypt and read all the information. In this way, information was kept safe. However, today, this system is not seen as the most efficient and safe way of sharing information with the developing technology. According to its original version, it can be said that modern cryptography has come a long way. It was mentioned that David Chaum was the first person to write an article about cryptography. At his article, he mentioned that data could be protected with cryptology. Chaum also recommended a payment system named as “blind signatures”. Blind signatures system enables that data can be hidden before signing and the digital signature can be verified without revealing confidential data content. Apart from Chaum, we see that Szabo also

focuses on solving the problem of double spending without the need for a central authority. However, these studies remained as studies and were not implemented till Bitcoin was developed by Satoshi Nakamoto in the late 2000s (Gates, 2017).

Cryptography system needs advanced mathematical operations which is the most important step for building blockchain. Cryptography can be basically defined as the science which helps keeping things secret by using encryption techniques. Besides, other main useful features such as data integrity, authentication and non-denial are what cryptography has. Encrypting plain texts with an algorithm and ciphertext are the basic starting point of cryptography. Plain text cannot just to be a text message or lettered information rather it could also be a numerical data or something like that. In cryptography, only the receiver who can decrypt it with the algorithm and key can see the encrypted information text. The message cannot be read by any others if the key is held by the any nodes. It is said that symmetric key cryptography and asymmetric key cryptography are the two types of cryptography. Symmetric key cryptography uses the same key for encryption and decryption, and sharing this key between nodes requires a secure communication way. This type of symmetric key cryptography is widely used such as HTTPS, SFTP, and WebDAVS which have large data sizes. On the other hands, the other cryptography requires two keys: the first key is the public key for encryption. The second key is the private key for decrypting the message. Because the message is digitally signed, authentication and confidentiality as well as non-repudiation are ensured. In addition, the need for a secure channel for key exchange is eliminated (Singhal, Dhameia, & Panda, 2018).

b. Peer-to-Peer Networks (P2P); P2P networks are a type of distributed systems network. These networks enable blockchain technology and many other applications to be processed without a central authority. This type uses the computing power of each node, such as processing power, storage capacity, and bandwidth, and consists of individual computers or nodes that enable data exchange between peers. The first sector to be affected by this system is the financial sector. As cryptocurrencies threaten the central authority of banks, the financial sector was the first to be adversely affected by this advantage of this crypto currency. This will not only affect the financial sector. Besides this, any business that acts as an intermediary between groups of people such as buyers and sellers, producers and consumers, borrowers and lenders will also be affected by this peer-to-peer interaction. (Drescher, 2017).

Three different peer-to-peer networks can be mentioned: pure, hierarchical and hybrid peers. Pure networks do not require a structured system or network, and there are random connections between nodes. Data exchange is done via message forwarding. However, this can result in a broadcast storm due to too much messaging traffic. We see that hierarchical networks are not independent of authority. Super nodes with higher resource characteristics manage peer-to-peer communication. It can be said that this network is disadvantageous because the defence mechanism of the network is weak because a super node is needed to direct the information exchange. Finally, in hybrid networks, as the name suggests, it is seen a mixture of pure and hierarchical networks. This type of network includes nodes and the directory server where the server enables the connection between the nodes via their IP addresses. Networks such as Spotify, Napster, and Bit-torrent are examples of this type of network. It is seen that the broadcast storm problem has disappeared in hybrid systems. But it still has the disadvantages of hierarchical systems. Therefore, this network is best for a small number of inquiries. (Li, 2017).

c. Hash Functions and Hashing; Hash functions are one of the most important components of blockchain. They are not new concept for our world. But it has gained popularity with the blockchain. Hashing means that the activity under the cryptographic foundations of converting a data or message into a series of numbers or letters. The hashing, in its simplest form, is a mathematical algorithm. It converts any size of data into 32-character fixed-length strings according to hash type (Laurence, 2017). Original data expressed in a different format is represented in these characters. It is a one-direction operation and such operation cannot be returned to the original form provided by the path hash functions. Figure 5 illustrates the hash efficiency simply.

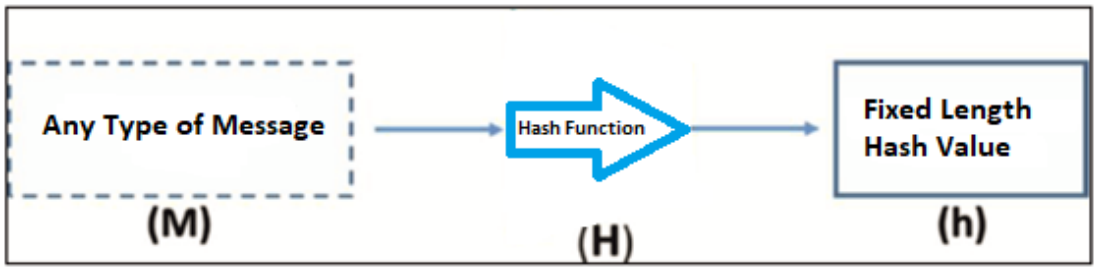

Figure 5. Basic Hash Efficiency
Source: Singhal, Dhameia and Panda, 2018

(M) represents the input that needs to be converted to a value-added or message digest, represented as (h). The hash function (H) is the mechanism or algorithm that will perform this conversion. The direction is a one-way operation that represents the operation that cannot be resolved backwards. The original input (M) cannot be estimated or found (Drescher, 2017). Hash functions are mostly used in digital signatures. However, it is seen that this function is also used for some protocols such as identification protocols. From the view of digital signature framework, the hash saves time and space. For ensuring data integrity, the hash compares the recalculated hash and the original hash to help determine if the hash value has changed at some point. To implement these applications, hash functions are expected to have the following properties:

a. Converting all kinds of data into new data in a short time,
b. Being deterministic which means that the same input produces the same hash value each and every time,
c. Being pseudorandom which means that the hash value cannot be estimated from the input value,
d. Being one-directed way which means that possibility to converting the hash value to the original input data doesn't have,
e. Being unique which means that the hash function does not produce the same hash values for different inputs (Drescher, 2017).

There are also different classifications of hash functions, which are basically divided into keyless and keyed. For example; one of them is MD4. MD4 belongs to the message (MD) family, which is one of the oldest. Another one is the family of Secure Hash Algorithms (SHA). It is more popular and has varying versions (SH-0 to SH-5). In order to generate addresses, Bitcoin benefits from both of them. It can be seen that Bitcoin is using SHA-256 and RIPEMD-160 (Singhal, Dhameia, & Panda, 2018). Another example is the Merkle tree introduced by Ralph Merkle. It is a bottom-up tree of hash values. Working with a large amount of data, the Merkle tree creates a binary tree containing the raw data to be hashed from the lower (leaf) level to the upper (root) level. It can be preferred because it validates large data sets efficiently and helps to protect these clusters (Singhal, Dhameia, & Panda, 2018; Usta & Doğantekin, 2017).

d. Consensus Mechanisms: The blockchain represents a structure in which there are many reliable and valid participants who must agree on the data to be added to the system. Network must check and approve any activity to be added to. In this way, unity is achieved. This is why the consensus mechanism is needed in blockchain structures. This consensus mechanism enables data to be processed and validated by the network for distribution among peers. In simple terms, consensus can be defined as an agreement between nodes of the blockchain network that confirms data and shares it uniformly on every participant's device. (Laurence, 2017).

However, who will propose the block and how nodes will agree on the block proposed by any node are some uncertainties about consensus mechanism. Let's think about a mechanism where every node proposes a block at the same time, it is inevitable that there will be a chaotic environment where monitoring and control processes become difficult. To prevent such chaos, consensus mechanisms help solve the problem by applying certain rules. At this point, hash puzzles are assisting to the system about who will issue. For example; if any node wants to propose a block, then a complex hash puzzle must be solved faster than other nodes and dig the block. At the end, such node is earning the reward to dig the block.

Below it could be seen what an effective consensus mechanism must have:

(i) Consensus about laws, rules, transitions and states,
(ii) Consensus of nodes, methods and stakeholders,
(iii) A sense of identity inside of system. At this way, members will feel they are all equal (Morabito, 2017).

All kinds of threats and attacks can be eliminated as soon as possible at reconciliation mechanisms. Such mechanisms should be defined in this way. Basically, it is the expected threat to the network that determines the type of consensus used in a blockchain. But other criteria are also taken into account, including decentralized governance, core structure (predefined steps), authentication, confidentiality (access) and fault tolerance, integrity (verification and verification practice) (Morabito, 2017). The customized consensus method should have been created depending on the nature of the entries added to the system.

Proof of Work (PoW), Proof of Stake (PoS) and Practical Byzantine Fault Tolerance (PBFT) are the most well-known and used types of consensus systems (Singhal, Dhameia & Panda, 2018; Morabito, 2017). Proof of Work (PoW) consensus mechanism is working like that. As it is understood from the name, it needs the work of nodes, where in order to create a block and add the block to the chain, a lot of computational power is needed. A lot of energy, calculation, and speed are needed at this type of consensus. However, it is starting to be hard for nodes to verify and compute when so much data entry is starting to enter to the system. It will avoid fraudulent behaviour

as it is too costly to be rejected by the network for any node trying to propose a block. PoW is better in systems that do not require the trust of the participants. However, it works very slowly and the speed of this system depends on the last node verifying the transaction. Examples of the most popular PoW consensus are the Bitcoin and Ethereum blockchains. Proof of Stake (PoS) is more about the number of coins owned. The act of verifying transactions is directly proportional to the coin stake owned. More held shares increase the chances of participating in block verification. Factors such as stake age, randomization and node richness determine the criteria for being a validator in the PoS system. The most famous methods for validation are randomization and coin age selection, although the largest stake has a higher chance of being an approver. Thanks to all these features of PoS, system is working faster, environmentally friendly, cheaper and it has secure (Singhal, Dhameia, & Panda, 2018). However, criticisms of the system are appearing, since there are no penal sanctions for those who want to act fraudulently in this system. To this problem, Ethereum's Casper protocol has several solutions that develop a system where fake validators will cause them to lose their profits. Peercoin is the first and more famous example of a PoS system builted according to the age of stake. Finally, we can cite another alternative to consensus mechanisms, Practical Byzantine Fault Tolerance (PBFT). This system takes its name from the tactics of the Byzantine generals to decide whether the information obtained is correct or not. In this system, the discourse of the majority is important for verification. At this point, Byzantine Fault Tolerance can be defined as; It is the ability to protect itself from malicious actions by consensus provided by the majority of nodes sharing a network. In this method, the system continues to work by tolerating the Byzantine error. Basically, the system tries to synchronize other stakeholders in the network. But unlike other systems, these transactions do not happen through rewards or mining. In Byzantine Fault Tolerance, it is seen that every node in the network has a public and private key, but each node knows the public keys of the others. As a result, transactions can be verified or servers can be updated. First, the transaction is controlled by each node. The transaction is then signed and shared for a certain number of nodes to verify. For this reason, in order to keep any threat away from the network, the network must be aware of the status of each node (Singhal, Dhameia, & Panda, 2018; Morabito, 2017; Usta & Doğantekin, 2017).

Types of Blockchain

Blockchain has its own dynamics. It can be said that blockchain networks are built for some purposes such as contract execution, data storage and money transfer. Therefore, they need different structures to achieve these goals. The selected structure determines how the system will work and what its features will be. At this point, access right is one of the important features that should be determined. The structure of the chosen blockchain type determines who can read and write transactions, how transactions can be initiated and maintained, and who can verify transactions etc. Some transactions are made public, while others only need to be seen by a few parties. There are several approaches to categorizing blockchain types. Drescher (2017: 216) summarizes his approach from the perspectives of transparency, privacy, security and speed. Table 1 below shows the categorization of access rights;

Write Access	Read Access and Creating Transactions	
	Everyone	Restricted
Everyone	General and Unauthorized	Restricted and Unauthorized
Restricted	Open to Everyone and Authorized	Restricted and Authorized

Table 1. Four Structure of the Blockchain in respect to read and write
Source: Drescher, 2017.

For example, anyone can join the existing system as a reader, writer, and creator in public blockchains. On the other hands, access rights are held by participants in private blockchains.

Unlike Drescher, Bambara and Allen (2018) structured blockchain types into three. Although two of them are same as Drescher the third system is called as consortium blockchains. The system is limited only to the nodes specified in the protocol in such blockchain. Such blockchains are called “partially decentralized system”.

Possible Application Areas of Blockchain

Blockchain technology has its roots in the late 1900s. After gaining popularity after 2008 Crisis, it is first seen at finance sector (Usta and Doğantekin, 2017). Today, however, it is clear that blockchain can be used at different areas. Drescher (2017) provides a summary for concrete blockchain application areas that are test applications and could be in the future. Cryptocurrencies, micropayments, digital assets, notary services, auditing, tax and voting can be listed as some of them. Rather than Drescher, it could be added that Singhal, Dhameia, and Panda (2018) list the uses of blockchain technology in different areas. Finance, insurance, banking, healthcare, supply chains, IoT (Internet of Things), media and entertainment are some of them.

As it can be understood from the information above, it is concluded that there will be different areas where it will be applied in the near future. In summary, below it will be focused and explained in which areas blockchain is used such as law, insurance, finance and supply chain and logistics.

a. Law: Due to its smart contracts system, it is expected that in near future blockchain technology could change how the judiciary system will be. Lawyers will be expected to be technologists. Self-executing contracts will play a dynamic role in dispute resolution. In this context, a deep understanding of blockchain technology and distributed ledger technology by intermediaries is required in order to perform the process correctly and meet the needs of customers (Bambara and Allen 2018). While the industries are growing up, much of the work is still laboriously done manually which means that time is wasting in document creation and management activities. Such activity's cost to firms is more than $9,000 yearly. At this point, technologically based blockchain technology is expected to reduce wasted time and increase productivity thanks to its automotive process, accessibility, transparency, speed and data integrity features. Electronic Signatures, Intellectual Property, Property Rights, Automatic Regulatory Compliance and Machine-to-Machine Payments are some possible applications of blockchain technology which is started to use or expected to use at near future.

b. Insurance: The insurance industry is a competitive industry with high customer expectations. Blockchain technology is promising in terms of creating better products and markets in this industry due to its advantages such as increased efficiency, cost savings, transparency, faster payments and fraud reduction. Drescher (2017) states in his book that industries such as insurance will develop blockchain solutions and smart contracts are promising tools. He also mentions that managing property rights or how rules are enforced in a blockchain world will have a huge impact in the years to come. Together with this, in order to achieve a perfect automated smart contract in insurance, blockchain needs to accompany technologies such as the internet of things (IoT). With them, the blockchain network can automatically process insurance claims (Bambara and Allen, 2018; Gupta, 2017; Usta and Doğantekin, 2017).

c. Finance: Satoshi's article on Bitcoin provides a clear indication of how blockchain technology can be an alternative to existing financial systems. Blockchain technology is defining many financial activities such as stocks, bonds, mutual funds, and derivatives etc again. Due to some advantages mentioned before phases, new projects such as Ripple have been launched in the field of banking and finance after Bitcoin (Swan, 2015). Gupta (2017) gives examples of use in trade finance and cross-border transactions for the finance sector. For example; IBM is one of the first one transferring all information more than 4,000 users via blockchain system and distributed ledger. Decentralized Finance (DeFi) emerges as a new paradigm against the current system. With blockchain technology, as all know, network structure does not require some third one in order to do transactions between groups. So, it means that intermediaries will be eliminated anymore. The network mechanism establishes the trust mechanism between unknown sides. At the end, it could be easily said that a more efficient and limitless infrastructure has been created. Decentralized currencies, payment services and contracting etc could be seen as the main areas of DeFi (Chen and Bellavitis, 2020).

d. Global Supply Chain System and Logistics: In a complex global supply chain system, many goods are flowing between many parties. So, the traceability of the system has to be seen as an important element for the proper management of these flows. Many inefficiencies, delays and failures occur within the global supply chain and these return to agencies with high costs. It can be said that, visibility, fluctuating customer demand, inventory management, and coordinating operations are the main challenges in the global supply chain. Between these challenges, supply chain visibility is an important warning to all sides because visibility concerns are thought close relationship with quality and usability, where solutions to improve the traceability of flows throughout the entire system make an important contribution to the global industry.

We can list some examples of the flaws of current supply chains as follows;

(i) Half the cost of carriage for documentation in container transport,
(ii) Labelling errors in seafood products increased to 87 percent in the 2010-2012 period.

The report states that the global economy derives 2 percent of its income from counterfeiting, the global counterfeit value has risen to $1.2 trillion, the value will reach $2 trillion in 2020, that is, 2 percent of world trade, 5-6 percent of EU and US imports are estimating counterfeit, and showing that less than 1 percent of counterfeit imports can be detected at the US Customs and Border Patrol (OECD/EUIPO, 2019).

In the global supply chain system, Radio Frequency Identification (RFID), Quick Response Code (QR), Electronic Product Code (EPC), Enterprise Resource Planning (ERP) and Sensors etc are some of the technological tools currently used for the purpose of transparency. However, it cannot be said that these technologies alone provide

effective solutions. There is a long way to go in supply chain management, especially in terms of security and trust. If the data is still going on to be managed centrally, such negative points in the global supply chain system will continue to wait on the desks of the managers. For the customer, under these conditions, it will be difficult to verify the safety of the products they consume (Chen et al. 2017). It could be supported that blockchain is very helpful for global supply chains in order to support traceability and transparency at this point. For example, it is mentioned that blockchain has smart contracts which are very useful for tracking goods both upstream and downstream in the global supply chain. So, it is expected that the follow-up of global supply chain flows could be tracked better and easier. It must be also mentioned that blockchain assists to cost efficiency because it creates a real-time visible within the global supply chain.

In terms of logistics providers, the use of blockchain technology is also in question. Today, in global trade, the transportation of goods from the exporter company to the importer is provided by land, sea, air, railway and pipelines. CMR, Seaway Bill of Lading, Airway Bill of Lading and CIM transport documents are used, respectively, in transportation by land, sea, air and rail. These documents are the documents that contain the information about the goods to be transported and the details of the transportation. The information contained in these documents has importance that affects the export and import processes. Incorrect information in the documents will adversely affect these processes. Blockchain technology minimizes the risks by preventing the negativities to be encountered. In addition, thanks to blockchain technology, informal activities such as tax losses and smuggling will be prevented. With the use of it, tax losses at customs will be prevented. For example, the country of Egypt is currently trying to control this through the CargoX platform that it has created during the import processes. Relevant documents are uploaded to the system prior to the import transactions to be made to this country, customs inspection is taken before the goods arrive at the customs borders, as a result, tax evasion is prevented and the risk of loss and theft is minimized, and time is saved by completing the import transactions in a shorter time. Another advantage of creating the documents mentioned in logistics activities with blockchain technology is to prevent the problems that will be experienced in the cargo process during the shipment of these documents to the importer after the export process. As it is known, after the exporting company completes the export process, it sends the relevant documents to the importer according to the payment method via post offices. In this process, there is a possibility that export documents may be lost, stolen or destroyed due to force majeure. Blockchain technology reduces these risks to zero and again, it allows the importer to save time and the exporter to achieve financial savings. The WAVE BL blockchain infrastructure, one of the platforms that provide bill of lading with this system, it has reported that it has made more than one hundred thousand e-bill of lading transactions in the first three quarters of 2022. Shipowners using this system, on the other hand, are described as leading shipowners in their sector such as MSC, ZIM, ONE and Hapag Lloyd.

Well-Known Blockchain Platforms

Platforms with open or private source codes that project creators can use to start their projects are called blockchain platforms. These platforms can be open source or private according to business purposes (Usta and Doğantekin, 2017). These platforms have been developed for different purposes in different sectors. Some criteria come to the fore in the selection of the platform to be used. These criteria can be broadly listed as follows:

A. Is the platform constantly being improved?
B. Which kind of blockchain is needed?
C. Which programming language does it use?
D. What is the popularity of the blockchain platform?
E. Does the blockchain platform has the consensus protocol?
F. Which kind of functions (security, transparency etc.) are needed?

It is known that Bitcoin is the first one of such platforms. After Bitcoin, so much new platforms have been appeared such as Ethereum, Hyperledger, Ripple, IBM Blockchain, Microsoft Azure Blockchain, Quorum and Corda according to the aims and requirements. Below side some of the important ones like Bitcoin, Ethereum, Hyperledger and Corda will be mentioned briefly.

Bitcoin

Bitcoin can be defined as an open-source platform for peer-to-peer payment transactions. Bitcoin is an innovative alternative to banks and intermediaries like Western Union. There are numerous inefficiencies in conventional existing systems. A few of them are as follows; transaction fees are high, a transaction takes a long time to settle, it is not completely transparent, and transactions are tied to authority. Thanks to Bitcoin platform, all of these inefficiencies are overcome. Bitcoin system is constituted according to consensus mechanism. In order to ensure

the continuity of the network, PoW incentive mechanism is also used. In addition, one other function of it is that system is working as a decentralized distributed ledger in which data can be recorded in an immutable and secure manner (Usta and Doğantekin 2017). Nakomoto (2008) summarizes what Bitcoin is in the Whitepaper: "A purely peer-to-peer version of electronic cash and it allows online payments to be sent directly from one party to another without going through a financial institution."

Ethereum

Ethereum is a state machine that allows transactions in a trusted messaging framework with a proof-of-work mechanism like Bitcoin. But the network is also being developed to have PoS to increase performance. Besides enabling transactions, Ethereum also has many other applications such as smart contracts application (Karame and Androulaki, 2016). Ethereum is an important tool especially for businesses that conduct transactions over contracts. It can also be used to transform global supply chains when performance issues and scaling issues can be properly managed by network developers.

Hyperledger

Hyperledger is another open-source community. The system is designed to meet the different expectations and needs of businesses gathered under the umbrella of the Linux Foundation, which consists of around 230 organizations, such as trust and autonomy. That's why Hyperledger has a philosophy of responding to these changing needs. Due to its features, the system is used in many areas from finance to supply chains. Its most striking use is seen in the project developed by the IBM Food Trust, which tracks food from soil to fork.

Corda

Corda was launched in 2018 two years after Hyperledger. It is another enterprise blockchain development community to provide a distributed platform for recording and processing shared data. Such platform is specifically designed to improve business deals between trading partners. For this reason, smart contract logic that provides pre-agreed rules has brought different perspectives to enterprise blockchain projects as they offer a unique feature of Corda, a flow framework to facilitate processes between notary pools and partners to manage transactions and reconciliation. While similar in some ways to Hyperledger and Ethereum, it differs in that the platform offers a single-node infrastructure.

The Challenges of Digital Currencies for the International Monatary System

Although Bitcoin or a similar digital currency does not seem close to replacing sovereign currencies, its popularity makes economists question developments in the international monetary system.

Evolution of Private Currencies

Nishibe states that Bitcoin is a pioneer for the development of private currencies that can be managed by individuals, companies or public authorities that will compete against conventional currencies (Nishibe, 2016). Nishibe sees crypto money as a means of realizing his proposal to denationalize the currency and allow free competition of currencies, as noted by the Austrian economist Friedrich Hayek (Nishibe, 2018). According to this view, private currencies will begin to compete with national currencies, and ultimately this competition will break the public monopoly. In addition, offering alternative means of payment to individuals will make them reject unstable currencies and will cause them to prefer currencies characterized by low inflation.

According to Nishibe, for example, Japan's fights with deflation and the quantitative easing policies of the US Federal Reserve (Fed) causes some sharp ups and downs about currencies and volatility at markets. In the light of Hayek's theory, this makes the dollar, euro and Yen not attractive currencies (Nishibe, 2017). This is why Nishibe advocates the idea of broader monetary competition beyond national currencies through the inclusion of digital private currencies.

Volatility of Digital Currencies

We can characterize his argument by pointing out that in the 2010-2014 period, Bitcoin was more volatile than gold and major national currencies (Dwyer, 2015) and would therefore be "expelled" from the system if a choice were made in the Hayek sense. However, Bitcoin may appear competitive for certain economies marked by the high volatility of national currencies, such as Argentina or Zimbabwe.

Time-consuming Process

Halaburda and Sarvary point out that network and inertia effects play a very important role in the context of monetary competition (Halaburda and Sarvary, 2016). Inaction, also emphasized by Birch, appears to be a potential barrier to self-adoption of a new currency according to Mondex's experience. It is essentially based on a currency infrastructure and this represents a fixed cost that the user will try to amortize over time. For example, Mondex states that in the case of an electronic wallet, a new user must first go to a bank, fill out a form, deposit the amount to be deposited in the wallet, and then wait to receive the magnetic card. Despite the promise of lowering transaction costs, these annoying steps can be discouraging for some potential users.

Converting Conventional Currencies to Digital Currencies

Similarly, for digital currencies, Halaburda and Sarvary say users should have a digital wallet and find a way to convert their currency to Bitcoin. Traders accepting Bitcoin must adapt their accounts to include the new currency, i.e., set a price in Bitcoins for their goods or services and find ways to convert between Bitcoin and national currencies (Halaburda & Sarvary, 2016). These actions represent so many costs that they can limit the size of Bitcoin users. Such inadequate users will affect the size of the market as well as an important determinant of the international impact of a currency.

Competition between Dominant Currencies

Unlike Hayek, Wong drew on the experience of competition between the sterling and the dollar at the beginning of the 19th century to emphasize that the value of a currency lies in the use of it by more than one third party. This mechanism automatically leads to the permanence of a small number of international currencies (Wong, 2019). Dominant currencies tend to capture new markets and limit the development of competing currencies. In this perspective, digital currencies are unlikely to dominate the international currency scene, currently competing for the dollar, euro and yuan.

Diversity of Digital Currencies

Halaburda and Sarvary say that the diversity of digital currencies jeopardizes their chances of being used. The Financial Times (2018) listed 1,387 cryptocurrencies in a recent article, including Bitcoin, 39 of which have a market cap of more than one billion dollars and represent about a third of the cryptocurrency market. Each has its own rules for process verification protocol and emission limits. This diversity is an obstacle to the digitization of money because the fragmentation of projects can be a barrier to reaching the critical user base necessary for a payment network to function properly. The Bank for International Settlements (cpmi 2015) emphasizes that the small size of digital currency markets cannot guarantee the efficiency of their technology if a significantly larger number of transactions are made.

A Secure Asset

Bitcoin is sometimes presented as a safe asset in international financial markets, especially by Andolfatto (2018), who supports Bitcoin with its relative simplicity in terms of monetary mechanism and policy. An asset is considered safe if it can be traded without fear that one party will know more about the asset's value than the other. Financial instruments such as life insurance are more complex than Bitcoin or gold, which makes them more attractive.

Safe Haven

Nishibe specifically mentions the episode of the Cyprus financial crisis in 2013, when Cypriot and Russian investors preferred to get their value out of Cyprus by converting them to Bitcoin. For this reason, the value of Bitcoin in dollar terms doubled between March and April 2013. This capital flight in times of crisis towards a value considered "safe haven" is characteristic of safe assets. Kaul and Sapp defined a “safe haven” as a currency that brokers invest in during times of uncertainty (Lee, 2017). Habib and Stracca explained that the ideal safe haven should be isolated from market turbulence in times of crisis (Habib, Mileva and Stracca, 2017).

Global Liquidity

According to Habib and Stracca, another important feature of safe havens is liquidity on a global scale. In this context, Bitcoin has a comparative advantage. The peer-to-peer networks underlying digital currencies, as noted

by Bank for International Settlements (cpmi 2015), are global by definition. They do not discriminate based on the location of the individual and therefore allow international transfers (Reiss, 2018). In addition, the transaction speed does not change according to the distance between the payer and the payee. Finally, in a context where restrictions are imposed on international payments by financial authorities, the decentralized nature of these networks makes it difficult to impose restrictions on transactions in cryptocurrencies.

Exchange Rate Volatility

In the literature, exchange rate volatility is mentioned as a factor that distinguishes between the dollar and the euro (Chinn and Frankel, 2019). Finally, it shows that the reliability of historical reserve values of reserve currencies is an important parameter in investors' preferences.

Financial Tool for Developing Countries

Bitcoin could also create a financial instrument in developing countries by allowing it to provide a means of deposit that allows one-time withdrawals, such as the M-Pesa advocated by Birch (Birch, 2017). However, there is also a major obstacle to the development of digital currencies in developing countries. Access to the internet, which is indispensable for these currencies, is still limited.

The Future Expectations for Crypto Currencies

According to Birch, Central Banks issuing digital currencies will be one of the most promising developments for cryptocurrencies. However, the attitudes of national regulators differ significantly on these currencies (Birch, 2017). For example, after one of the websites (Silk Road) was closed at the beginning of 2010s, US officials pointed out that decentralized digital currencies have an interesting potential for payment systems. In 2014, the British government announced that the technology owned by cryptocurrencies has the capability to improve existing payment systems. In the second quarter of 2017, the Japanese Financial Services Agency officially recognized Bitcoin as a means of payment, allowing payments in Bitcoin for goods and services (Financial Times 2017b). Koning says that in the modern paradigm, Central Banks do not offer dematerialized payment instruments such as current accounts or credit cards to the public, and private banks do not offer paper money such as banknotes (Koning, 2016). If Central Banks decide to make the voice of digital currencies heard in some way this will also be seen as an indication of a break from the current paradigm.

In addition to the positive developments above, there have also been some negative developments regarding crypto money technology. In 2016, the European Central Bank made a statement that digital currencies had neither legal validity nor currency in economic terms. In 2017, the Beijing Government opposed cryptocurrencies to protect the value of Yuan and financial stability. At the end, the Central Bank of China banned Bitcoin trading at domestic market. This led to the end of Bitcoin-Yuan trading with cryptocurrencies such as OKCoin or Huobi traded on Asian exchange platforms (Financial Times 2017a).

Birch also demands a centralized digital currency. The words of David Andolfatto on this subject, vice president of the Federal Reserve Bank, are a reference to Birch. According to Andolfatto, there is no major obstacle preventing Central Banks from offering online money services to individuals and businesses, such as direct accounts in digital currency with the possibility of deposits (Andolfatto, 2018). According to Birch, the main advantages of such services would be to encourage innovation in payment systems and improve financial stability as central bank direct accounts would be less risky than deposits in banks (Birch, 2017).

Finally, with the participation of these instruments in the financial system, the participation of even the most disadvantaged segments of the society into the financial system will be accelerated. It can be said that a centralized digital currency would be superior to Bitcoin because it would be better suited to the needs of society. For example, in countries like Norway, cash is almost never used. The Bank for International Settlements points out that it may be more attractive to issue a centralized digital currency in such countries where cash is almost never used. However, care should be taken as there are many unknowns about the cyber security of such structures (Bech & Garratt, 2017).

The Effect of Blockchain on International Payment System

A blockchain system allows users to easily monitor their transactions. It records these transactions and is a large distributed ledger that prevents these records from changing (Nofer et al., 2017). However, it creates a secure and

transparent environment because only registered users in the network have access to blockchain data and changes in the system are implemented and documented instantly (Li et al., 2020).

These systems support distributed network structures and digital data storage. The most common application is crypto money systems and the most known of this system is Bitcoin. Blockchain technology was discovered in 1991 and became known with the implementation of Bitcoin in 2009. In this designed system, security is provided without the use of third parties.

Blockchain system differs from existing data systems in terms of data generation. As mentioned earlier, data in the blockchain system is stored in interconnected blocks like a chain, and these stores have limited storage capacity. When a block is introduced to the system, it creates its own timestamp. Data stored in these blocks can typically be saved and accessed by any members. However, these data are transaction data that cannot be changed or deleted. Thanks to this feature, the blockchain system provides a superior security to the distributed ledger.

In modern cryptocurrencies, inclusive finance is realized by combining the technology of increasing the advantages of blockchain and Bitcoin in the issuance mechanism (Boi-ko, 2018). Compared to the old cryptocurrencies, it can be said that the new cryptocurrencies have more advantages in terms of credit subject, organizational structure, currency stability and ecological structure. According to Costigan and Gleason, thanks to these modern cryptocurrencies, people all over the world will receive equal financial services, payment costs will be significantly reduced in international business activities, and due to such advantages, it will become the most widely used currency (Costigan and Gleason, 2019).

It can be said that cryptocurrencies have some difficulties as well as the advantages mentioned. The following sections will explain the positive effects and things to do and adverse effects and possible solutions of cryptocurrencies on the international payment system.

Positive Effects and Things to Do to Increase These Effects

It is known that cryptocurrencies do not need centralized regulations for payment transactions. It is easy to mentioned that this is one of the biggest impacts of cryptocurrencies on international payment systems. If this situation is explained, cryptocurrencies do not need banks or governments for payment or money transfer transactions. This is the biggest reason for the increase in the processing speed of international payments in almost all cryptocurrencies used. Thanks to these systems we have mentioned, there is no need to obtain permission from any authority or to comply with any regulation in order to make an international payment (Kuah, 2020).

Similarly, thanks to cryptocurrencies, an ordinary individual can perform instant person-to-person transactions worldwide. This means that people do not pay high transaction fees to intermediary institutions such as banks for international money transfers. Banks or brokerage firms charge RTGS fees for processing an international transaction. On the other hand, cryptocurrencies do not charge such fees in international payment systems. In addition, it is seen that transaction fees are higher in traditional international payment systems compared to international payment systems using cryptocurrencies (Dostov et al., 2019). In addition, cryptocurrencies add anonymity to the international payment transaction (Kuah, 2020). Institutions such as banks or other intermediary institutions that make the payment process reveal the identity of the person or institution making the transaction when performing an international transaction. This identity is not revealed in transfer transactions made with cryptocurrencies. Therefore, the protection of personal data between the parties performing the transaction is ensured.

Another issue that needs to be mentioned is the form of taxation. Customers using a traditional form of international payment must pay capital gains tax to the federal government when they make an international payment. It can be said that cryptocurrencies are more advantageous in such taxation transactions. For example, governments can make international payment systems using cryptocurrencies attractive by exempting some transactions under one hundred dollars from tax. Such a situation will encourage retailers, gas stations, restaurants and other similar establishments to accept cryptocurrencies (Corbet et al., 2020). In short, it can be said that the scope of cryptocurrencies will increase if the federal governments show the necessary attention to these currencies and make the necessary regulations.

In addition, the actions of various governments or monetary authorities that affect market dynamics such as the inflation rate, the determination of interest rates, control the value of the conventional currencies. Such factors adversely affect international money transfer systems and can also slow down the speed of the payment system. This does not apply to cryptocurrencies. It can be said that cryptocurrencies add value to international payment

methods at this point because the factors mentioned above do not have any effect if the payment method is made with crypto systems (Coppola, 2019).

Similarly, in international payment systems using cryptocurrencies, the transaction cost is lower than in traditional international payment systems. One of the reasons for this is that cryptocurrencies do not have any physical currency. As is known, these systems have digital currency. They can carry digital currencies in wallets and all they need to access that currency is to remember certain keys (Coppola, 2019). Therefore, it can be said that the transaction cost of international payment systems using cryptocurrencies is much lower than the transaction cost of traditional international payment systems.

Another advantage of cryptocurrencies in the context of international payment systems is that wallets can carry various international currencies as well as national currencies. These cryptocurrencies allow their customers to transact in various currencies in international payment systems (Coppola, 2019). To put it simply, customers using cryptocurrencies can pay in any currency they want in line with the currencies available in their wallets in the international payment system (Coppola, 2019). This means that cryptocurrencies influence international payment systems by offering cross-currency payment options. For example, let's say an American businessman wants to pay someone in Japan. The businessman in America has to send the payment in US dollars (USD), but the recipient in Japan has an account that accepts the Japanese yen (JPY) (Dostov et al., 2019). This means that traditional international payment systems ask the businessman in America to convert US dollars (USD) to Japanese yen (JPY) in exchange for paying the party in Japan in Japanese yen (JPY) (Giudici, Milne, & Vinogradov, 2019). The conversion to USD-JPY may take several days, during which exchange rate fluctuations affect the conversion of USD-JPY. This may cause harm to one or both parties transacting using traditional international payment systems. If the transaction was made with one of the cryptocurrencies rather than the traditional payment method, both parties would not have been harmed in the event of a serious movement in the exchange rate. The American businessman would convert the US dollar (USD) to any cryptocurrency, and the Japanese side would have converted the cryptocurrency to Japanese Yen (JPY) and completed the transfer, and the transaction would be completed within minutes (Giudici, Milne, & Vinogradov, 2019). Another cryptocurrency to be used in this transfer is Rip-ple. Transactions with the cryptocurrency Ripple do not require any currency conversion. Also, conversion from any currency to Ripple can happen automatically. The example appears to influence international payment methods by adding automation to cryptocurrencies and adding various new features that traditional currencies cannot.

Another point worth mentioning is that in many parts of the world, including the USA, some banks and intermediary institutions support the use of cryptocurrencies. These establishments have special meters for customers who want to make their payments with cryptocurrencies. This is another reason why users increase their trust in cryptocurrencies.

Finally, the advantages of blockchain in the L/C payment method, which is used as a traditional payment method in international trade, will be emphasized. As it is known, in international trade, buyers and sellers (importers and exporters) are located in different countries. For this reason, companies that will trade for the first time generally have a trust problem with each other. In order to solve the trust problem, the banks have an important task. One of the traditional payment methods is the letter of credit payment method. It can be said that the letter of credit payment method is more secure than others. In L/C method, the issuing bank guarantees that the payment will be made to the seller who meets the conditions in the letter of credit. Although the system seems safe as a payment method, it has a difficult structure to implement in practice. For example, since the system is paper-based and does not work in coordination, the same documents could be prepared by the companies again, the document control processes are carried out manually by the banks, these processes cause time loss for companies and banks, because the system is paper-based, it includes the risk of forgery and fraud, due to the risk of forgery and fraud, banks conduct more rigorous examinations and this makes banking services expensive, the risk of documents being lost during the document submission processes may occur, and as a result of all these, the workflow processes in customs administrations may slow down. The difficulties of this method (document, presence of many parties, expertise, etc.) are eliminated thanks to the encryption method provided by the blockchain technology. As stated before, the parties involved in the system – in which more than 100 people or institutions and more than 1000 data must be managed in each letter of credit transaction – can track every transaction made or to be made in blockchain technology, making payments with letters of credit very fast and secure. And this contributes to the solution of the other problems mentioned above. This is a good example of the discovery and development of new usage areas such as smart contracts in later processes, while providing the use of this blockchain network only in the Bitcoin payment system at first. At this point, it should be noted that the second phase of Ethereum, which is another payment structure, focused on smart contracts too.

Adverse Effects and Possible Solutions

Cryptocurrencies also have various shortcomings in payment systems. One of the biggest challenges of cryptocurrencies is scalability. For example, the number of transactions Visa makes in the international payment system is much higher than the number of payments made using cryptocurrencies. In addition, cryptocurrencies may face limited transaction speed. MasterCard and VISA, which are traditional international payment systems, have higher processing speed in international payments (Boukhalfa, 2019). One of the reasons behind this situation is that crypto money payment systems do not have sufficient infrastructure around the world yet. In order to achieve maximum benefit, this infrastructure system will need to be spread all over the world.

Acceptability and stability are one of the most important requirements for an international payment system. Considering that many fiat currencies are still not viable in global trade today, it will take time for cryptocurrencies to be used as acceptable currency. Today, it is clear that the acceptability of cryptocurrencies is moderate compared to conventional ones globally. Likewise, one other adverse effect of cryptocurrencies in the international payment method is unstable volatile nature of these currencies (Boukhalfa, 2019). Price volatility in cryptocurrencies is a major issue and is the biggest reason why it is damaging international payment systems. Such situations mean that the use of cryptocurrencies is not yet fully accepted. Steps should be taken to increase the acceptability of these currencies and ensure the stability of these currencies in order to make users habitual to use cryptocurrencies.

Cybersecurity vulnerabilities of cryptocurrencies are another negative impact on international payment systems. Although technology may seem like our friend, malicious uses can negatively affect many systems, including cryptocurrencies. Hackers can hack into international payment systems using different cryptocurrencies or breach their information (Coppola, 2019). On the contrary, an advanced infrastructure emerges in traditional payment systems. These systems have robust security measures in international transactions. However, cryptocurrencies can protect against hacking and theft through innovative and advanced cryptographic technologies (Dostov et al., 2019). Blockchain technology has a crucial role at this point. This technology eliminates the possibility of duplication of an international transaction and minimizes the possibility of fraud in cryptocurrencies. However, it is needed to perform robust security measures used by traditional banking systems (Fry and Cheah, 2016).

The most important feature of cryptocurrencies is that they do not have a centralized structure. While this feature provides advantages in some cases, it also creates disadvantages in some cases. The lack of centralization is another challenge. This means that cryptocurrencies cannot be regulated by intermediary institutions such as the government or monetary authorities. This is also meant that users are not ready to use this decentralized structure without any legal authorities, which also harms international payment systems (Dierksmeier and Seele, 2016). Despite the nature of cryptocurrencies, federal governments should do their bit to ensure that cryptocurrencies can be used in international payment systems and mitigate their negative effects. In this direction, there is a need to introduce state-backed cryptocurrencies. Similarly, due to the lack of government regulation of cryptocurrencies, most businesses and investors cannot afford to take a risk using such international payment systems without government regulation (Corbet et al., 2020). Today, it is seen that international payment systems supported by cryptocurrencies lack government support and regulation. For this reason, many investors do not trust such international payment systems (Shanaev et al., 2020). As a result, federal governments and states are required to design and implement regulations for cryptocurrency markets. In this way, users' trust in cryptocurrencies will increase and they will be used more in international payment systems.

The technology risk and the unwillingness of federal governments to be a part of this system will cause investors not to invest in such international payment systems and these systems will not be used by people. For this reason, it is expected that steps will be taken in order to increase the security and recognition of the system.

Conclusion

Blockchain technology, which initially gained popularity with Bitcoin, later turned into a different way of doing business. Cryptocurrencies are now taking attention of most of the business sectors. This is a game chancing technology for a decentralized, distributed world which is likely to be possible in the near future. However, it should not be forgotten that it is an evolving technology that needs improvement and testing for its best understanding and implementation. Currently, it has still scalability, applicability, sustainability, expertise, etc. concerns over the issues. However, as new models are developed and tested, it will be better understood and developed in line with the future needs and requirements of businesses and customers.

Cryptocurrencies, one of the developing payment systems worldwide, have significant effects on international payment systems. Today, many researchers and scientists are investigating these effects to understand it.

Future research is needed to understand the relationship between cryptocurrencies and information technology infrastructure. The positive effects of the information technology platform on international payment systems are significant for cryptocurrencies. The biggest reason behind this is that most of the problems with cryptocurrencies are caused by weak information technology platforms in the world.

It highlights the negative and positive effects of cryptocurrencies on international payment systems and aims at possible solutions to improve the efficiency and practicality of cryptocurrencies to overcome the challenges associated with these currencies. The limitations of cryptocurrencies are responsible for their negative impact on international payment systems. It would also be useful to find possible solutions to overcome the difficulties associated with cryptocurrencies.

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