International Journal of Finance and Managerial Accounting, Vol.9, No.35, Autumn 2024 IJFMA

Application, Pros and Cons of Blockchain Networks

Alireza Ouriat
phD Candidat in Industrial Management ,Department of Industrial Management ,Roudehen Branch,Islamic Azad University, Roudehen,Iran
a_ouriat@yahoo.com

seyed Alireza Mirarab Baygi
Assistant professor, Department of financial Management, Roudehen Branch, Islamic Azad University, Roudehen,Iran
mirarab_alireza @yahoo .com

Saber Khandan Alamdari
Assistant professor, Department of Industrial Management, Roudehen Branch, Islamic Azad University, Roudehen,Iran
sabersum@yahoo.com

Submit: 12/03/2023 **Accept:** 08/04/2023

ABSTRACT

Blockchain is a peer-to-peer system accompanied by two main objects: it allows the individual, on one hand, to add his/her new transactional data to the background is stored collectively. On the other hand, avoid any kind of manipulation of the recorded transactional data.

Blockchain has made a balance between the two aforementioned objects through the structure of merely appendant and non-manipulated data in which adding data is carried out in the form of new blocks through solving the Hash puzzle. Solving the Hash puzzle entails taking time. The cost of manipulating Blockchain history, emphasizing the necessity of solving the Hash puzzle to add new data, has been increased prohibitively. In the most general case, on one hand, the supply chain links are related to the raw material suppliers, and on the other hand to the customers. Prompting the customers' demands is the main object of activities related to the supply chain, so that the desired product can be delivered to the customers with the highest quality and the minimum price, at a certain time. Therefore, the supply chain includes all activities related to the flow and exchange of goods and services, from the supplying of raw materials stage to the delivery of the final consumable product to the customers. Knowing about the advantages and application of these networks in management is an essential and vital issue, thus, this study investigated the application, merits and demerits through library and note-taking methods.

Keywords: Blockchain, Block chain, supply chain

1. Introduction

Blockchain technology is basically a distributed database of the documents, and/or general ledger of all transactions along with the digital events which are jointly carried out through constituents. Each transaction is realized in the general ledger with the majority agreement of the system components. Once information enters the system, it will never be deleted or removed. Blockchain records definitive and verifiable information for each unique transaction. Stealing a cookie, for instance, from solitude shops is much easier than stealing it from a large store in front of thousands of witnesses (Seyed Hosseini & Doaeei, 2014).

Blockchain is a public ledger in which all the transactions which are held so far are included there and is always improving constantly through adding new blocks. New blocks are added based on the date and sequentially or catenulate. Blockchain consists of the whole address of all the accounts and their content from the beginning till now (Seyed Hosseini & Doaeei, 2014).

Blockchain is designed in a way that is resistant to invaders. Blocks are linked to each other in order to create transactions history to avoid their changes. The connection between the blocks is made by the encrypted linkage. They cannot be forged unless the invaders have the access to extensive computing resources. the nodes keep and additional database, apart from the block chains, called "Unspent Transaction Output Memory (UTXOM)". UTXOM is a subsidiary ledger that records all the available funds on each address. In fact, this database acts as temporary storage for block chains. When new transactions are entered, the aforementioned database is updated and the remittance amount is subtracted from the sender's address and added to the receiver's address. This database is more similar to the central databases that exist at the heart of the most centralized systems (NavabPoor et al., 2017).

2. Blockchains Networks Types

Blockchains Networks are categorized into 2 groups: Public Blockchain and Private Blockchain.

1.2. Public Blockchain

Public Blockchain does not have any limited accessibility. Whoever can access the internet connection, will be able to send transactions and become a validator on the network (i.e. participate in carrying out a consensus protocol). Typically, such networks offer economical motivations to the individuals who ensure network security.

Some of the largest and most well-known public Blockchains include: Bitcoin and Ethereum (Yaga et.al., 2019)

2.2. Private Blockchain

No one can join the Private Blockchain, unless they are invited by the network administrator. Participant and validator's accessibility is restricted. This type of Blockchain is appealed to companies that are interested in Blockchain technology but not convenient in the control level provided by the public networks. Typically, they seek to include Blockchain in their accounting stage and their background without distorting independency and the risk of exposing sensitive data to the public on the internet (Yaga et. Al., 2019).

3. Block chain (Blockchain)

3.1. Applications of Blockchain

Although block chain is the infrastructure of cryptocurrencies, mostly virtual currencies are active on its platform, it is not its only application. Unfortunately, sometimes the terms Blockchain and cryptocurrencies are not distinguished and considered equivalent. Some of the functions of the block chains (Blockchain), in the following, are explained.

3.1.1. Cryptocurrencies

Cryptocurrencies are the most obvious presence of Blockchain technology in finance. Blockchain technology has entered the economic field since 2009 along with the emergence of Bitcoin. Since then, Bitcoin and other cryptocurrencies have had an undeniable impact on the world's financial industry. Defining, designing, creating and releasing cryptocurrencies through companies, institutions and even different individuals can have many economic effects. The variety of services and players is very large in this field and every day we encounter defining new solutions and commercial models. Many startups are entering this field every month across the world and the public can use their defined services simply through only installing an electronic wallet on their

cellphone. Cryptocurrencies also affect traditional players of the financial exchange market including banks, currency-exchange shops and payment companies (Ahmadi Joshfaghani, A. & Bahari Bandari, 2017).

3.1.2. Decentralization of the Infrastructure Computation

Blockchain can be considered as a software design method that joins some computers to each other and usually uses a similar consensus process to release, record and store information, and all their transactions and relations are validated by the cryptography (Mogayar, 2017).

3.1.3. Transaction and Bargain Platform

A Blockchain network can confirm various types of transactions related to digital currency or assets are digitized. Whenever an agreement is reached, the transaction is recorded on a block that has storage space. Blockchain keeps track of another Blockchain and thus this platform is able to keep small and large transactions (Mogayar, 2017).

3.1.4. Decentralized Database

Blockchain can disrupt the transactional database processing paradigm. Blockchain is like a place in which you can store semi-public, all types of information, in a linear box (block). Everyone can confirm you put this information because this box has your signature on it, but only you (along with a program) can see whatever you put in this box because only you have the private keys which are very secure.

Blockchain, therefore, acts as a database, except that some of its information is stored and its header is public. Undoubtedly, Blockchains are not very efficient informational banks, but they have no problems. They do not want to be substituted by large databases, but it is the duty of software developers to understand how to rewrite their programs to use the transactional and trading capabilities of Blockchain. (Mogayar, 2017).

3.1.5. Distributed and Shared Accounting General Ledger

Blockchain is also a general ledger or distributed asset ledger which is public and time-stamped stores all the made trades and transactions with processed ones in a network and lets the computer user validate each transaction in a way that no other additional computation will be needed. This general ledger can be shared by multiple parties which can be private, public, or semi-private.

Although a distributed general ledger of trading and transactions is a common definition of Blockcahin and some can be considered as the best program, this is only one of the Blockchain features (Mogayar, 2017).

3.1.6. Software Development Platform

Blockchain, to the developers, is the best and the first set of software technologies. They have political and social backgrounds which are being laid (decentralization), but they bring technological innovation. This new set is one of the developing tools for an exciting event for software engineers. Blockchain consists of some technologies to create a new generation of applications that are decentralized and secured through cryptography. Therefore, Blockcahin is a new way to build these applications.

Blockchains can have a diverse range of Application Programming Interface (API) including transaction programming language, person-to-person communicative nodes programming relation, and client programming to examine trading and transactions in the network (Mogayar, 2017).

3.1.7. Open Source Software

Most powerful Blockchains are open-source, which not only means that the software is publicly available, but also that innovation can be collaboratively done on top of the software core. the Bitcoin protocol core, for example, is open-source. Since its initial development by its creator Satoshi Nakamoto, the protocol has been maintained by a group of core developers who have strengthened and improved the protocol over time. Additionally, thousands of independent developers benefit from the stability and power of the Bitcoin protocol with products, services, and applications and do innovation. The fact that Blockchain software is open-source is considered as a powerful feature. The more open the Blockchain core is, the stronger the ecosystem around it will be (Mogayar, 2017).

3.1.8. Financial Services Market

Money is at the heart and center of crypto-based Blockchains. Once cryptocurrency is considered like any other currency, it can be transformed into a

financial instrument that will lead to the development of various new and diverse financial products.
Blockchains provide a unique and extraordinary environment for the next generation of financial services. Once cryptocurrency price volatility decreases, this issue will become popular. Derivatives, options, exchanges, hybrid instruments, investments, loans, and many other traditional tools will have their own cryptocurrency versions, and thus a new market for financial services will be created. (Mogayar, 2017).

3.1.9. Peer-To-Peer Network

The Blockchain has no centralization. Structurally and architecturally, the main layer of the Blockchain is a peer-to-peer network. A Blockchain decentralizes through synchronous processing at its nods location. You confirm each transaction on a peer-to-peer level and validate each other transactions on a peer-to-peer level. In fact, a Blockchain can be considered a thin computing cloud that is truly decentralized.

Each user can immediately trade with another user, regardless of business hours or where they are in the world. To filter, block, or delay transactions between two or more users or between nodes using the same transaction, no intermediary is required. Any group in the authorized network can offer services based on its knowledge of transactions elsewhere in the network. In addition to creating a peer-to-peer technical network, Blockchains create a marketplace of users, as well. Blockchain networks and applications create their own distributed economies with various sizes and intricacies. Therefore, Blockchains bring with them economic models which is a key feature. (Mogayar, 2017)

3.1.10. Trust Services Layer

All Blockchains are trusted as an indivisible and atomic unit of service. In essence, it is a function and a service that has been delivered. However, trust is not limited to transactions and dealings. Trust has been extended to data, services, processes, identity, business logic, terms of a contract, or physical objects and can be applied to almost anything that can be digitized as an (intelligent) asset with inherent or associated value (Mougayar, 2017).

3.1.11. Smart Contract

Smart contracts are contracts that are automatically executed by computer protocols. The use of block chain technology has made it easier to register, identify, and execute smart contracts. Open-source companies such as Ethereum and Kodius have provided the possibility to use smart contracts of block chain technology. Many companies that worked on Bitcoin and block chain technologies also support smart contracts, and many situations where capital could only be transferred under certain conditions, such as creating face-to-face contracts by lawyers or providing deposit services by banks, have been replaced by smart contracts (Gholami et al, 2018).

3.1.12. Know Your Customer (KYC)

The purpose of customer identification is to ensure the accuracy of claims made regarding a person's identity. Identity authentication and customer identification mean confirming that you are who you claim to be. This identity verification is done by presenting a document from you (such as a national ID card or driver's license) or by providing specific information about the person's life that indicates their identity. It is important that the documents provided by you only confirm your own identity (such as your face photo, fingerprints, or similar items). To verify your identity, the photo on the card must be compared to your face. If it resembles your face, your identity authentication is done successfully. Otherwise, you will not be verified. Comparing your driving license photo with the face of who provided it takes place to ensure that another person does not present it (Darsher, 2019).

In this method, an entity which has financial transactions insures itself against the user’s legal problems and possible follow-up, by receiving a series of information from the customer. It is a mutual law and supports both sides of the transaction. Having this information, investor advisors or exchange shops deliver better services according to the customer status and the other party is also protected from the risk of delivering illegal services such as money laundering (Darsher, 2019).

The process of customer identification is one of the most important and the most policies in the global banking system and is considered as a minimum issue in bank reviews. This process contains three general steps which are:

3.1.13 Identity Authentication

Gaining the most possible information about the customer is the first step banks must do at the time of

opening an account for a customer. Workplace, income source, and his occupation, along with his basic information and characteristics are very important to the bank. A student at a university or a clerk, for example, does not have many transactions and therefore significant figures should not be considered in it (Hakimiyan et al. 2018).

3.1.14. Tracking (Monitoring) Customer Activity

Continuous monitoring of customer transactions by using tracking and controlling systems in order to examine the accuracy of the provided information by the customer (Hakimiyan et al, 2018).

3.1.15. Ensuring the Control System

It means evaluating the efficiency and updating systems that are used to control and monitor customer's financial performance. The issue of controlling customers' accounts is one of the problems that banks and in general economic system are facing which is considered as one of the main parts of the aforementioned process (Economic Administration, 2015).

Blockchain stability and transparency create an easy way for financial institutes to have quick and secure access to the updated customer information. This leads to increase operational proficiency, trust between institutes and decrease the costs, time process and user information collection, as well.

Blockchain, to the legislators, provides a single source to have better and clearer access and knowledge of the customers' activities in various financial institutions. From the customer's point of view, financial institutes can reduce waiting time by using know your active customer instruments (KYC) in Blockchain and eliminate the need for repeatedly providing similar information to the financial service providers (Hakimiyan et al, 2018).

3.1.16. Initial Coin Offering

Generally, Initial Coin Offering (ICO) is a method of Crowdfunding or fundraising for launching an idea using digital currencies. The term Initial Coin Offering refers to the initial money offering, and it can be easily inferred that companies can attract capital by offering their own coin or currency through ICOs. (Hekimian et al., 2019)

During the performing of the Initial Coin Offering (ICO) process, a startup can create a specific digital token for itself in order to attract capital for its business and sell a certain amount of those tokens to the public at an initial price. Typically, another cryptocurrency, such as Bitcoin or Ether, is obtained for selling these tokens, and through ICO and the public's interest, a startup can financially support itself to carry out its operations. (Hekimiyan et al., 2019)

4. Disadvantages of Blockchain Technology

The most important technical Blockchains restrictions are:

4.1. Lack of Privacy

Blockchain is a distributed peer-to-peer general ledger that has the history of all the transaction. All the transactions features are available to everyone, including subject, weight or amount of it, parties, and time of transaction. It is necessary because it allows each network nod to recognize the assets ownership and the legitimation of new transactions. Hence, in order to avoid the re-spending attacks, lack of privacy is one of the fundamental components of Blockchain. Blockchain, without this level of transparency, cannot justify the expected functionality. However, this level of transparency is considered as a limiting factor to the functions requiring a higher level of personal information preservation (Darsher, 2017).

4.2. Security Model

Blockchain uses asymmetric cryptography in order to identify, authenticate and finally grant the authority to the users to perform transactions. Account numbers are, in fact, the public keys of cryptography in Blockchain. The holder of the appropriate private key can access the asset related to the user's account. Data related to each transaction contains a digital signature which is created by a valid private key. Only these kinds of transactions can be considered as a document on transferring ownership. The private key is only a security instrument that determines the legal owner's competency. As a private key of an account is in the possession of another person in any way, consciously, accidentally, by mistake, or through stealing, that account security is revoked. There are no security safeguards to protect assets related to a user's account. It is worth noting that asymmetric cryptography used

in Blockchain is among the best and strongest methods of available cryptography. Therefore, there are no problems included in the concept of security in Blockchain. But at the same time, there is no other security layer to protect users' assets against losing private keys accidentally. Similar conditions are true on the house, car or credit card password. When your property key is in the possession of another person, aside from conditions or this situation, your property security will be at risk. The holder of the bank card password can access all your money, and the holder of the car key can drive your car. There is no exception to the private key in Blockchain. Nevertheless, some consider the lack of additional security level can be a weak point in Blockchain (Darsher, 2017).

4.3. Limited Scalability

Blockchain is a peer-to-peer system with 2 main objects: it allows anyone, on one hand, to add new transaction data to the histories kept collectively. On the other hand, it avoids any manipulation of the recorded transactions data.

Blockchain has made a balance between the two aforementioned objects through the structure of merely appendant and non-manipulated data in which adding data is carried out in the form of a new block through solving the Hash puzzle. Solving the Hash puzzle entails taking time. The cost of manipulating in Blockchain history, emphasizing the necessity of solving the Hash puzzle to add new data, has been increased prohibitively. Unfortunately, this level of network strength leads to the reduction of processing speed and as a result limits the scalability of the network. This feature of Blockchain, is considered as a serious obstacle to the usage of this technology in functions that require faster processing speed, scalability, and high efficiency (Hakimiyan et al. 2018).

4.4. High Costs

The issue of high cost is somehow related to the issue of scalability. Solving the Has puzzle or in other words, proving work needs complicated computational operations; a security instrument that made the manipulation of transaction data history impossible. These high costs can emerge in various forms including computational operations, spent time, and consuming electricity and money. Although the result is always the same, proving work is expensive. Therefore, Blockchain is a cost-effective technology. The size of this cost depends on the difficulty of the Hash puzzle (Hakimiyan et al. 2018).

4.5. Hidden Concentration

The necessity of solving the Hash puzzle for adding a new block to the chain and the rule of granting awards to the participants in maintaining the integrity and the accuracy of the system function leads to the weaponry races among the network nods. The holder of sufficient financial resources can acquire a great deal of processing power by investing in the appropriate equipment and solving the Hash puzzle in a profitable way. On the other hand, validating operations and adding new transaction data to the network for another part of participants who do not have proper resources or facilities, has gradually become more difficult and uneconomical until it leads them to stop participating in this group in the network. As a result, a large and diverse group of independent users participating in maintaining the integrity and accuracy of the network function was replaced by a small group of the holders of large computational resources and plenty of hardware facilities. The remaining group divides the responsibility of maintaining integrity and network function accuracy among themselves by creating a monopoly. This small group, like a monopoly in other areas, can abuse its power (for instance, to ignore some special transactions or discriminate against users). These conditions impose a kind of hidden concentration on the inherently decentralized Blockchain network (Hakimiyan et al. 2018).

4.6. Legal Inadmissibility

Blockchain is a technology that gives its users the possibility of managing and transferring ownership in an open and fully distributed space. The way independent nods manage their ownership during a collective distributed interaction leads to questions and concerns related to the legal consequences of accomplished and managed transactions on the Blockchain platform. Questions related to the legal and juridical results and the amount of accomplished transactions authenticity on the Blockchain platform must be answered without considering aspects such as security and technical complexity. These questions refer to a new way of looking at ownership

management which differs from the common way of legal systems. Those who witnessed the improvement and development of the Internet in the early days, may see some similarities between the current status of Blockchain and the legal inadmissibility of Internet commerce in the 1990s (Darsher 2017).

4.7. Users' Inadmissibility

Inadmissibility by the users' community is another important limitation that cannot be ignored. The Blockchain legal case causes uncertainty for users and as a result, their unwillingness to use this technology. On the other hand, training users regarding Blockchain and their knowledge in this regard is related to the acceptance level of this technology. It is irrational to expect users to trust and use Blockchain without knowing its basic principles (Darsher 2017)

5. Advantages of Blockchain Technology

The advantages of Blockchain are described in the following table (Bashir, 2017):

Table 1: the advantages of Blockchain technology

Advantage	explanation
decentralization	There is no need for a third party or trusted intermediary, instead, a consensus mechanism is implemented for transactions
Transparency and trust	Blockchain is a general ledger or a distributed, public, and time-stamped assets ledger that holds all the accomplished or processed transactions in the network and allows the computer user to validate each transaction in a way that no double calculation will not happen.
Unchangeable	This general ledger can be shared by multiple parties which can be private, public or semi-private.
Highest accessibility	The existence of a peer-to-peer network and a copy of the recently updated data that is available to all nods can place the system in the highest level of accessibility. Even if some nods leave the network or become unavailable, the network can still continue its activity.
High security	The accuracy of all data is ensured by using encryption methods.
Simplifying and securing current models	Current models are very irregular in some industries such as the financial or health industry. So that different entities keep their own database. This issue (lack of integrity and order) is due to the natural difference between systems that make data sharing very difficult. But Blockchain can be used as a single shared general leger among the willing parties. This technology can lead to the easiness and safer current models through the reduction of various management systems that each can be kept by an entity.
Faster transactions	Blockchain, in the financial industry, especially in post-trading settlement operations, can play an important role by providing the possibility of faster settlement in transactions; because a single copy of the agreed-upon information is shared in the general ledger between the financial organizations, there is no need for the long process of validation, modification, and clearance.
Cost saving	As there is no need for any intermediary in Blockchain, overhead costs are eliminated which were previously spent on the existence of the intermediary.

6. Supply Chain Based on Blockchain

Blockchain ability to ensure trustworthiness, traceability, and authenticity of information along with the smart contractual relationships for a trustless environment all imply rethinking in the supply chain and management of it. How Blockchain works in the supply chain is still controversial. Blockchain, unlike Bitcoin and other financial functions, may be public; the supply chain networks based on Blockchain may need a closed private authorized Blockcahin with some limited layers. But for a more general set of relations, the way is still open. Determining the level of privacy is one of the initial decisions, the following graph illustrates a public graphic of transforming a traditional supply chain to a Blockchain-based supply chain (Saberi et al, 2019).

Four main entities in the Blockchain-based supply chain play this role; some are not seen in the traditional supply chain. Civil registrars provide unique identities to the network agents. Standard organizations define standard schemes such as fair trade for sustainable supply chain or Blockchain policies and technological requirements. Certifiers play a role in certifying these 4 entities in the

Blockchain-based supply chain; some are not seen in the traditional supply chain. Agents including manufacturers, retailers, and customers who must be registered by an auditor or a certifier are certified in order to maintain system trustworthiness (Steiner et al., 2015).

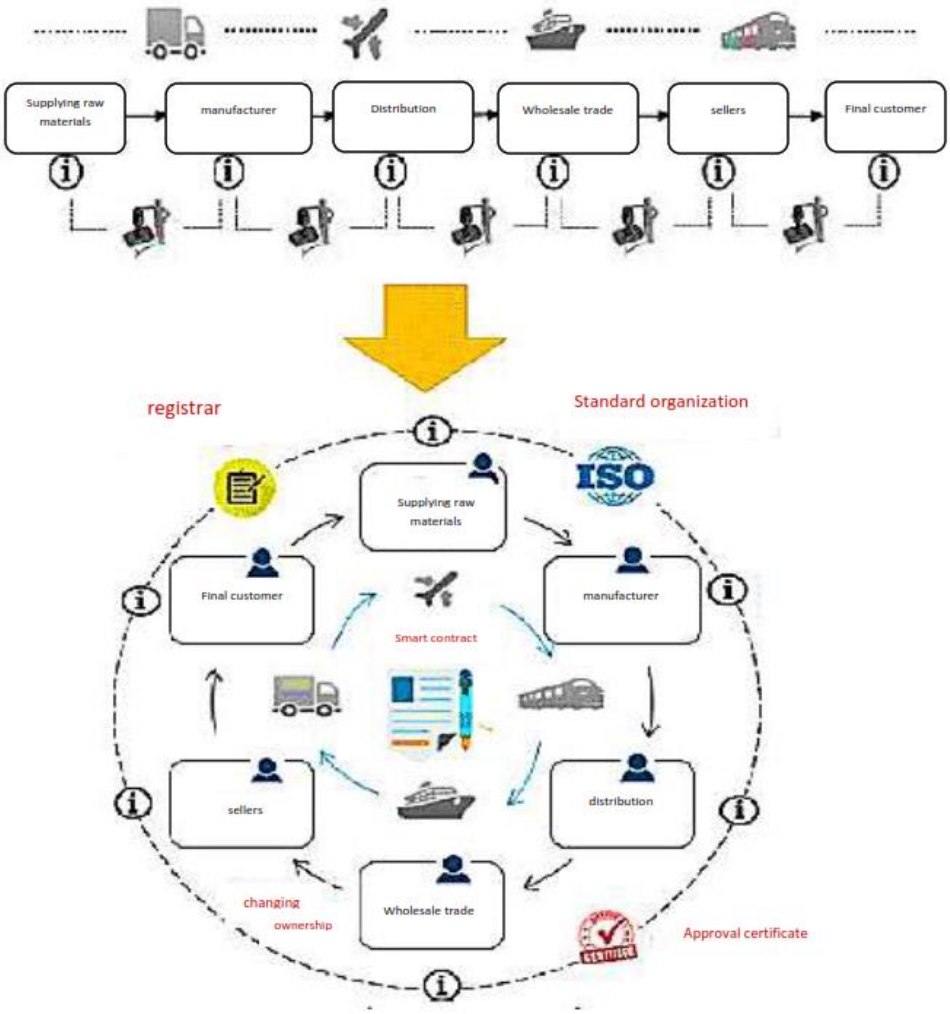

Figure 1: transformation of the supply chain (Khodadapour, 2018)

It should be mentioned that there are impacts on material and product flows in the supply chain and a digital Blockchain mat be in each product so that all related factors can access directly to the product profile. Security measures may be set in order to limit accessibility, where only parties with correct digital keys access a product. There is a domain of data which can be collected, including the product status, types of products and standards that must be considered for a product (Tian, 2017). An attached information tag to a product illustrates an identity determinant that connects physical products to their virtual identity in Blockchain (Abeyratneh and Monfared, 2016).

An interesting structure and characteristic management flow are how a product comes under the ownership or is transferred by a special player. Allowing agents to add new information to the product profile or to start a business with another party, is likely an important rule; where obtaining permission may require smart agreements and cooperation (Khodadpour, 2018).

Before transferring a product to another actor (or selling), both parties may sign a digital contract, or implant the requirements of a smart contract to verify the exchange. Once all parties provide the contractual requirements and processes, the details of the transactions update Blockchain general ledger. Once a change is initiated, the data transaction records will be automatically updated by the system (Abeyratneh and Monfared, 2016).

Blockchain technology can describe at least five key dimensions of the product: nature (what is the product?), (how is the quality?); quantity (how many products are there?); place (where is the product?), and ownership (who is its owner at any given time?). in this way, Blockchain eliminates the need for a central trusted organization that carries out and protects this system and allows customers to examine an uninterrupted chain under the custody and transactions of the raw materials to the end of the selling process. This information is recorded along with verifiable updates in the general ledgers when the transactions in the aforementioned Blockchain dimensions occur (Khodadpour, 2018).

It is expected that Blockchain trustworthiness and transparency facilitate effectively the information and material flow through the supply chain. This transformation may lead to a broader transition from an economic status of durable industrial products to an economic status of personalization of information. Manufacturing will be severely dependet on knowledge, communication and information than material characteristics (Pazaitis et al, 2017); for example, customers can trace detailed information of the products which increases the customer's trust to the product (Tian, 2017).

Smart contracts, like written stored rules in Blockchain, can help define the network player transaction among each other and within the system. Smart contracts affect network data sharing between the supply chain participants and contiguous process improvement. For example, certifiers and standard organizations verify actors' profiles and products digitally. Products and factors that have digital profiles are on the network by themselves that show information such as description, place, certifications, and relations with the products. Each supply chain player can add key information related to a clear product and its status on the network (Tian, 2017).

Process rules and the method of managing a smart contract in the Blockchain-based supply chain can manage the verification, certification, and allowance to access processes that are required for performing. Changing players' data can occur depending on the type, condition, and reason for defined supply chain through a smart contract. Agents can change rules without some form of unanimity and consensus process; another example is that a smart contract between two trading partners can legitimately update immediately an automated record of what goods are offered, sold, or delivered by the final users in business line (Maurer, 2017).

The characteristics of a smart contract process represent a continuous improvement of the potential business process for the supply chain processes. The potential improvement of the supply chain business process can be inserted in the Blockchain information which may gain performance metrics in the general ledgers; which links them to agree on processes. This information, beyond product delivery and concerns related to management, has great potential to inform supply chain design and immediate consequences (Saberi et al, 2019).

It should be noted that Blockchain affects both the supply chain process and product management and financial transactions between various network parties (Hoffman et al, 2017). Determining financial intermediaries is a key and potential advantage of Blockchain supply chain, including payment networks, stock exchange, and money transfer systems (Tapscott, and Tapscott, 2017). This will make the commercial processes more efficient between parties. Inefficiency in the supply chain financial flows can be reduced through supply chain financial instruments and techniques such as reverse factoring and dynamic discounting; which saves million dollars in the networks (Fanning and Centers, 2016). Smart contracts can organize financial arrangements and ensure that enough budget is available for projects and guarantee that anyone will be settled at the due time (Hofmann et al, 2017). Moreover, they provide a link to trade between various currencies or mix from multiple sources in the global supply chain in a timely way (Eyal, 2017).

7. Blockchain Technology in the Supply Chain Financing

Blockchain recommends technological innovation for the reliability and safety of traditional transactions (Du et al, 2020). Multiple various nods can complete a transaction with the technology of distributed general ledger and book this process together, therefore monitoring the accuracy of the bookkeeping. Blockchain-distributed storage, stores completed data related to the chain structure based on the time-stamped in each nod. All nods have the same status, and configuration resources on the network, and ensure data security through an agreement mechanism. The information of transmitted data between each nod is kept through hiding technology that not only realizes trust in the content but also amplifies the nod's credibility. Coordinating cooperative behavior among various institutions, in supply chain financing activities in which some institutions participate, such as financial entities, upstream and downstream companies, supply corporations, consumers, and regulatory agencies, recording each institute's behavioral path and clarifying the responsibilities and different institutional obligations are those organizational guarantees to ensure financial activities in the supply chain (Zhang et al., 2021).

Blockchain technology functions and coordination features are highly compatible with multiple agencies in supply chain financing. Saberi et al (2019) found that the function of Blockchain technology can break the informational barriers between the central organization of a company and overcome many obstacles and have a negative effect on supply chain financial innovation. The technology of the distributed general ledger in Blockchain technology solves the issue of asymmetry of main information and thus each unit is recorded and shared. The problem of "difficult investment and expensive investing" for small and medium-sized companies in the traditional supply chain is very important. The result of obtained decentralization from the function of distributed general ledger causes the participants, especially small and medium companies or main units, to have more active participation in the supply chain activities, be familiar with the information, and use corresponding strategies to help the better improvement of the companies. Blockchain agreement mechanism makes the agreement on the supply chain irreversible and eliminates the possibility of private transactions. No nod can change the protocol alone or unilaterally or manipulate data between multiple objects even if all objects or target effective shares (the effective adjusted passing rate by the agreement mechanism is usually 51% or more) agree to change data and recorded main information remains intact, and new information will be recorded and main information inspection will be protected. These technologies create a very secure environment among the main bodies of the supply chain and achieve a high degree of mutual trust mechanism and agreement. All entities in the supply chain, through introducing Blockchain technology, not only reach a mutual trust and agreement mechanism in the whole chain which accompanies transferring point-to-point information made by decentralization, but also highly increases the coordination between multiple participants in the national supply chain financing (Blossey et al, 2019).

It is necessary to go beyond the overall business process of supply chain financing, optimize the scheme to develop weaknesses, integrate Blockchain in the development of the supply chain financing, and support the supply chain financing development (Zhang et al., 2021).

8. Block Chain Technology and the Supply Chain Financing Optimization

The informational infrastructure provided by the Blockchain effectively provides related information to the supply chain financing motivational events and represents a reliability system and a multifactor control mechanism to provide better multi factor coordination of supply chain financing (Min, 2019).

Supply chain financing platform uses central companies, commercial banks, or other supplies and budget corporations or warehouses as a first confirming group of Blockchain. These companies are considered as the main components of the supply chain platform. Keeping the smooth operation of the platform is the interest of the nods. Single-node interaction with platform data does not affect, in the absence of external catastrophic events, the smooth operation of the supply chain platform. As the Block chain system is not appropriate to store large data files, it is necessary to study the supply chain financing platform structure of the various commercial packages of the different commercial modules. Each module

interacts through a common form of data and communicates with the outer world. Each transaction module chooses key data according to the commercial needs and the protection of privacy and studies various recording methods of diverse demands. The structure of the supply chain financing embodiment platform analyses three key technical issues including data collection, data integration, and data presentation; which must be solved to access the embodiment of the supply chain financing. Blockchain technology leads to the mutual cooperation and supervision of some institutions in a place and avoids private collusion under the traditional supply chain financing model. The organization' validity status, under this open and clear mechanism, is compromised by the participants and stable transactions lead to not requiring the continuous examination of the validity of the various documentation (Chang et. al. 2019).

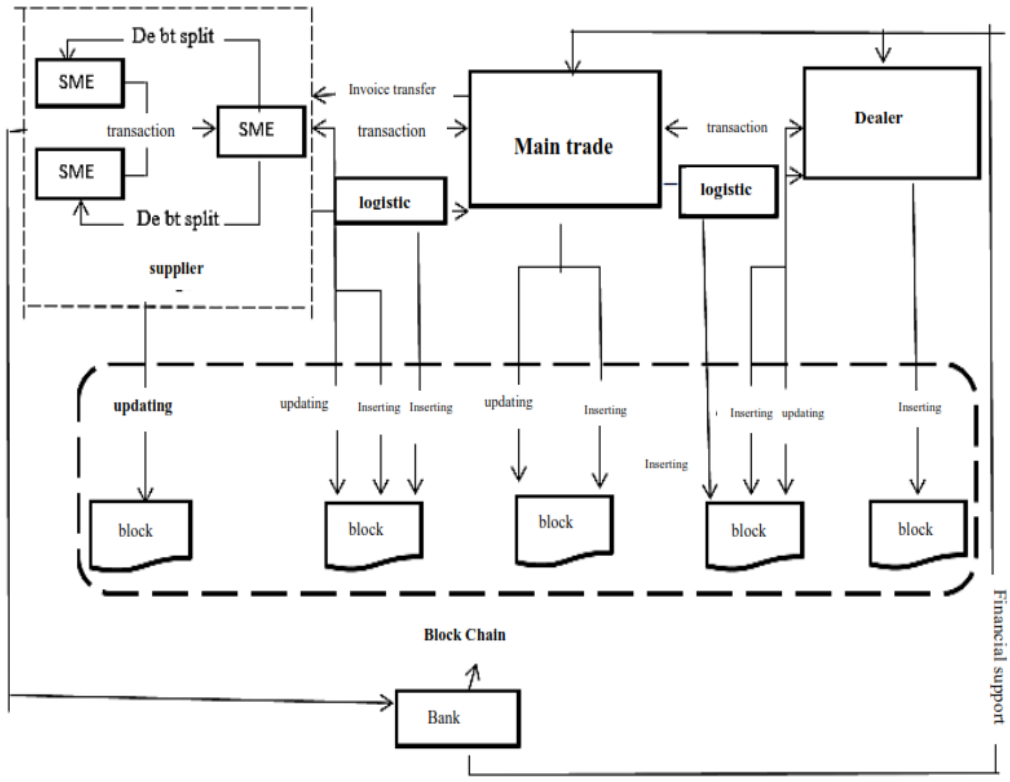

Figure 2: Blockchain technology to optimize the supply chain financing (Zhang et.al. 2021)

Supply chain financing operations must produce corresponding orders, accounts receivable, bills, accounts payable, financial collateral, and other recorded information among various institutions. Since supply chain financing is held among peer institutions, information is concentrated in the central corporations. Available information is very limited for upstream and downstream companies, buyers and sellers. Obtained information from the banks is restricted to the revealed information through central companies. Some problems, often arise, such as informational islands. Responsibility, power, and profit must be defined clearly by participant institutions in value creation, all institutions, especially central corporations or commercial banks like information center institutions in the process of the supply chain financing, must reveal all responsibilities and information of each institution as well, so that lower than the upstream and

downstream small and medium size companies can obtain the information (Zhang et.al. 2021).

All types of assets, in the response to the current weaknesses in the supply chain financing, are digitized in the supply chain consist warehouse receipts, invoices, contracts and etc., and encrypted into the digital assets; also financial ratios of the digital assets are extracted thoroughly; therefore, banks can understand the situation more realistically. By tokenizing the asset liquidity, Blockchain technology ensures that the process spin is open, clear, verifiable, and traceable at all times. Supplies and logistics, cash flow, and tokenized assets are combined based on the information flow in order to plan systematically the financial business of the supply chain institutes; judge every risk factor according to the empirical results; and create a rational and effective Blockchain system in the supply chain (Perboli et.al. 2018).

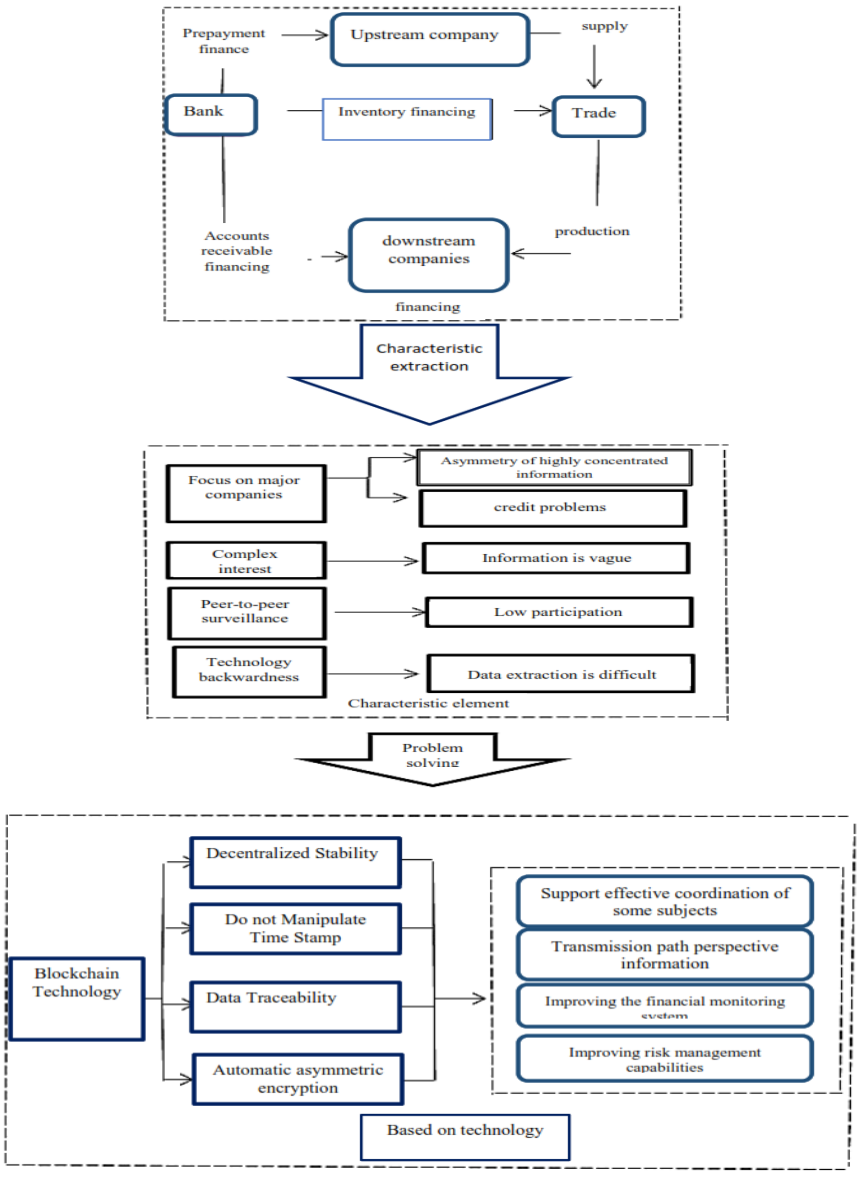

Figure 3: Blockchain technology in the supply chain (Zhang et al. 2021)

The credit rate in the supply chain, due to the limitation of the central companies' ability to endorse credit (validation), gradually decreases and electronic invoices have been created through Blockchain technology which can solve this problem. Blockchain technology can realize storing distributed assets of invoices, i.e. assets data will be stored in Blockchain and as a result, related assets personnel can realize point-to-point value transfer without the need for the physical invoices and focused systems to control and verify it. Central companies transfer their credit through Blockchain layers; verify small and medium downstream companies' credit; expand trust areas; and increase small and medium companies' financial opportunities. The reason why Blockchain invoices can help companies located at the end of the supply chain to pay low financial expenses and gain financial services is as follow:

1. Once Blockchain invoices are formed, the storage of distributed Blockchain makes newly established information data gain the approval of all the participant nods and thus ensures the validity of the information in the Blockchain invoices. 2. Because Blockchain nod data is arranged chronologically, once Blockchain invoices are sent down each invoice has a time-stamp and therefore interference in the invoice data is impossible and its validity is ensured during the irrevocable transfer process (Zhang et al., 2021).

One of the most important functions of Blockchain technology is accuracy in solving, transparency, and information security and using Blockchain technology in supply chain financing. Blockchain distributed general ledger data is shared completely, connect in the block units by the cryptographic (cryptography) algorithm and each participant in the network can save a complete copy of the shared general ledger and data security is ensured based on the cryptographic algorithm, and as a result, having double payment or colluding with the general ledger data is very difficult to the participants (Zhang et al., 2021).

9. Theoretical Validation of the Supply Chain Financing Model based on the Block Chain Technology Using a one-sample t-test

The results of the related analysis of the recommended structure validity of the research model are presented in this section. In fact, these results include analysis related to the research model structure (the supply chain financing model based on the Block Chain technology). Questions are designed in a way to give the respondents the opportunity of leaving their comments related to the axes structure and constituent domains by using the following options: "very little", "little", "a lot" and "very much". Related questions of this section and the analysis of each answer are presented below, as well.

Q1. To what extent the proposed model for supply chain financing based on the Block Chain technology is universal (according to all indexes)?

Related results to the validity of research model collectivity are presented in this section and the validity of this section is evaluated based on the related question. Out of 15 answers, 12 people chose positive and "very much" and 3 chose "a lot". As a result, the positive answers percentage equals 80%.

Table2: the validity of the research model collectivity

Research model collectivity	t	df	Significance level	Mean difference	Confidence interval 0.95	
					low	high
	35.546	14	0.000	3.8	3.57	4.03

Experts' opinions and a one-sample t-test were used to examine the research model collectivity. The results show that *t* rate at the 0.05 error level is 54.35 and the significance level is 0.000. Therefore, based on this, the theory that the research model is collective is confirmed by the experts.

Q2. To what extent the proposed model is unique (assigning each index to a component)?

Related results to the uniqueness of the research model are presented here and the validity of this section is evaluated based on the related question. Out of 15 respondents, 11 people chose positive and "very much", and 4 chose "a lot". As a result, the percentage of positive responses is 73%.

Table 3: results of research model uniqueness

Research model uniqueness	t	df	Significance level	Mean difference	Confidence interval 0.95	
					Low	high
	31.588	14	0.000	3.733	3.48	3.99

Experts' opinions and a one-sample t-test were used to examine the supply chain financing model based on the Blockchain technology. The results show that *t* rate

at the 0.05 error level is 31.58 and the significance level is 0.000. Therefore, based on this, the theory that the research model is unique is confirmed by the experts.

Q3. To what extent does the proposed model have internal coherence and uniformity (the homogeneity of each component indexes)?

Related results to the coherence and uniformity of the research model are presented here and the validity of this section is evaluated based on the related question. Out of 15 respondents, 11 people chose positive and "very much", and 4 chose "a lot". As a result, the percentage of the positive responses is 73%.

Table 4: results of coherence and uniformity of the research model

Coherence and uniformity	t	df	Significance level	Mean difference	Confidence interval 0.95	
					Low	high
	21.258	14	0.000	3.56	3.67	3.95

Experts' opinions and a one-sample t-test were used to examine the coherence and uniformity of the supply chain financing model based on the Blockchain technology. The results show that *t* rate at the 0.05 error level is 21.25 and the significance level is 0.000. Therefore, based on this, the theory that the research model is coherent and uniform is confirmed by the experts.

Q4. To what extent the designed model of the supply chain financing model based on the Blockchain technology is appropriate to the current needs and the considered organization perspective?

Related results to the appropriateness of the research model with the current needs and the considered organization perspective are presented here and the validity of this section is evaluated based on the related question. Out of 15 respondents, 12 people chose positive and "very much", and 3 chose "a lot". As a result, the percentage of the positive responses is 80%.

Table 5: results of the research model's appropriateness with the current needs and the considered organization perspective

Suitability with the considered organization	t	df	Significance level	Mean difference	Confidence interval 0.95	
					Low	high
	35.546	14	0.000	3.8	3.57	4.03

One-sample t-test was used to examine the experts' ideas in relation to the research model's appropriateness with the current needs and the considered organization perspective. The results show that *t* rate at the 0.05 error level is 35.46 and the significance level is 0.000. Therefore, based on this, the theory that research model is suitable for the current situation and organizational perspective is confirmed by the experts.

The results of this four-question questionnaire related to the theoretical validation of the research model are considered approved by the experts according to the questionnaire data and the analysis of all the questions and data. Thus, based on this, the research model is valid and can be considered as a basis of the supply chain financing model based on Block Chain technology.

10. Conclusion

The supply chain is all the activities related to the flow of materials and information which starts from the suppliers of the raw materials and continues to the product delivery to the final customer and emphasis on improving services, profitability, and organization performance (Dehghan Menshadi Abbasi Baghbadrani, 2018). The concept of supply chain consists of the management of all the various activities and processes which create final value to the customer and assist in creating stronger and more improved upstream and downstream links. Nowadays, goods and services, in the modern world are in a way that rarely organizations or institutes can provide a product or service without seeking help and cooperation with other organizations. Often, various organizations play role in producing and delivering services. Raw materials and necessary parts and items to manufacture a product, are provided by raw materials suppliers and spare parts suppliers who are in communication with raw materials suppliers, to an organization that is in charge of manufacturing it, and this organization delivers the product to the customers with the distribution channels aid; so all the individuals and organizations that cooperate to manufacture and distribute a product are called supply chains links (Motaghi & Hosseinzade, 2019). Block Chain is a peer-to-peer system with 2 main objects: it lets the individuals, on one hand, add his/her new transactional data to the backgrounds stored collectively. On the

other hand, avoid any kind of manipulation in the recorded transactional data.

Blockchain has made a balance between the two aforementioned objects through the structure of merely appendant and non-manipulated data in which adding data is carried out in the form of new blocks through solving the Hash puzzle. Solving the Hash puzzle entails taking time. The cost of manipulating Blockchain history, emphasizing the necessity of solving Hash puzzle to add new data, has been increased prohibitively. In the most general case, on one hand, supply chain links are related to the raw material suppliers, and on the other hand, to the customers. Prompting the customers' demands is the main object of activities related to the supply chain so that the desired product can be delivered to the customers with the highest quality and the minimum price, at a certain time. Therefore, the supply chain includes all the activities related to the flow and exchanging of goods and services, from the supplying raw materials stage to the delivery of the final consumable product to the customers. Knowing about the advantages and application of these networks in management is an essential and vital issue, thus, this study investigated the application, merits, and demerits through library and note-taking methods.

The findings of this research are presented and the result is criticized and controlled with a review of past research related to the surrounding issue. In the upcoming research, in the qualitative part, due to the collection of data and information from the interviews, and its analysis, thematic analysis method is used. Based on the qualitative data collection, after studying the literature related to the research topic, a framework was developed to ask the interview questions with the expert members. Finally, experienced executive experts in Digikala Company and related academic experts familiar with blockchain technology and financing were selected by judgmental sampling method. In the next step, the interviews were labeled (coded) using Clark and Brown's six-step inductive thematic analysis tool.Accordingly, in the part (phase) of getting to know the data, the speech evidences identified from the interviews were labeled in the form of several primary codes. After that, the initial codes in the form of five sub-topics, which include order registration and publication in blockchain technology, digital financing cycle, sending, data and smart contract (intelligentized) and finally two main topics under the title of supply chain financing platform. And the structure blocks were transformed into classification, after which the fuzzy Delphi method is used to increase the validation of the identified components. The results of the Delphi survey show the adequacy and approval of the identified factors.In the following, to measure the validity of the theoretical type of the research model in terms of comprehensiveness, uniqueness, coherence and integrity, the questionnaire tool was used, and to measure the validity of the analysis, the T-Tech test sample and SPSS software were used and It has been approved by experts. To express and explain the results of the research, the content is presented as follows: The continuous use of blockchain technology in supply chain financing has the potential to change the company's business practices. The model presented in the research shows how the blockchain technology is applicable or can be implemented and worked specifically in the field of supply chain financing. Each of the blocks that comprise the blockchain actually contains data that executes a smart contract.As a result, the development of a block is created by announcing a new transaction by adding the completed block to the chain of previous blocks. According to the mentioned cases and as presented in the research model, it can be concluded that a supply chain financing program based on blockchain technology should basically have two main baselines between the supplier and the buyer. The following points are worth mentioning, the exchange of information at any time and time in the supply chain that is reliable, confirmed and reliable, so that all members of the supply network have the ability to access information at any time. Validity assessment and automatic execution of reliable transactions are influenced by specified criteria created by a smart contract.In this regard, the background check and aligned studies confirm that the uncertainty in decision-making and financial participation between supply chain members has the ability to be reduced by building trust (Gross and Trebelmayer, 2021). It makes trust and confrontation easier and easier in determining the goal and solving the problem. Trust in supply chain members as a cooperative governance mechanism in financing has the ability to be used to create and increase value as well (Kovahvas et al., 2015). Meanwhile, blockchain technology has the potential to provide greater end-to-end transparency so that supply chain companies can

build the trust necessary for successful financing. This is despite the fact that blockchain technology, due to its nature, removes the need to provide and provide trust from the network, because the data cannot be used in the way of fraud and forgery.Blockchain technology has been described in Azhan as an unreliable system (Glaser, 2017) because it uses smart contracts as well as a distributed ledger to ensure that processes occur and perform correctly. Blockchain technology definitely enables the distribution of trust throughout the network. Because it requires a high level of trust in the supply chain process as a verified and immutable block and the transactions must be controlled and checked by the system itself. (Zhou et al., 2019). In this research, it has been tried to present a practical model for the use of blockchain technology and also to confirm and guarantee its potential by using the opinions of experts in this field, in line with solving the existing concerns and criticisms about the immaturity of this technology. were noticed.It is of particular importance that managers consider the requirements of using blockchain technology in their organization's supply chain financing. In this regard, using the model presented in this research can be useful in the following cases: All members of the supply chain can monitor the status of exchanges, products, resources, and financial transactions during the financing process from one company to another. to be monitored, reviewed, and based on the existing trust, information cannot be manipulated in blockchain technology, and exchanges are made according to smart contracts. There will be no mistakes and errors, because of the ineffectiveness of information transmission in the supply chain, a lot of money is lost, and this issue is more tangible in industries whose products can be damaged and damaged. It is special and bigger.The use of the model presented in this research also helps companies to identify their costly items and then use methods based on savings in financing in smart ways. The supply chain financing model based on blockchain technology presented in this research can lead to the reduction of costs, including the cost of money transfer fees through financial institutions and banks and other money transfer methods, and finally eliminate them. The cost of the announced fees is included in the calculation of the final price and the profit from the sale of products, and its reduction and elimination will increase the profit and reduce the final cost for the customer, and finally improve the financing efficiency. One of the most important problems identified in the current supply chain is the inability to integrate and unify information for all members of the chain.Providing a supply chain financing model based on blockchain technology is designed as a distributed system from which a transparent and specific storage location can be provided for data storage. In fact, each member of the chain has the ability to add new data to the blocks of blockchain technology, verify it, and verify its validity with smart contracts at the end. This means that all the members involved in financing the supply chain, or in other words, all the stores and companies, will have access to this information and can confirm its accuracy at each stage. A large number of stores and companies in the supply chain use the electronic information exchange system to send business information to each other.Sometimes this information is sent and shared with each other with a delay, and it does not reach the relevant companies at the same time as the products are sent. If product shipments encounter problems or their prices are constantly changing, the members of the supply chain will receive this information in the next electronic information exchange platforms. In the end, by using the supply chain financing model based on blockchain technology, the information is updated continuously and as a result, it can be transferred to the companies in the supply chain at any time. It is important to have only one true final version for sharing issued documents in the supply chain. These necessary documents and contracts can be provided in the financing of the supply chain based on blockchain technology and digital signature technology in a smart contract.As a result of this action, all partners will have access to the original documents and contracts. Blockchain technology as a member guarantees the immutability of issued agreements and contracts that the terms of the contract can be changed only if all members reach a group (collective) agreement. With the existence and implementation of this system, companies and institutions will spend less time and money on lawyers and go to the contract and negotiation table, and a large amount of bureaucracy will be eliminated. As a result, companies will have the advantage of spending more time on developing their products and growing their business

Reference

1) Cuevas, Javier Marcos; Julkunen, Saara; & Gabrielsson, Mika. (2015). Power symmetry and the development of trust in interdependent relationships: The mediating role of goal congruence. Industrial Marketing Management, 48, 149-159.
2) Dolgui, Alexandre; Ivanov, Dmitry; Potryasaev, Semyon; Sokolov, Boris; Ivanova, Marina; & Werner, Frank. (2020). Blockchain-oriented dynamic modelling of smart contract design and execution in the supply chain. International Journal of Production Research, 58(7), 2184-2199.
3) Du, Mingxiao; Chen, Qijun; Xiao, Jie; Yang, Houhao; & Ma, Xiaofeng. (2020). Supply chain finance innovation using blockchain. IEEE Transactions on Engineering Management, 67(4), 1045-1058.
4) Fan, Xinxin. (2018). Scalable practical byzantine fault tolerance with short-lived signature schemes (pp. 245-256). Presented at the Proceedings of the 28th Annual International Conference on Computer Science and Software Engineering.
5) Fathullah, Mehdi; and Najafi, Mahdi. (1395). Development of financial management model of supply chain and chain financing. Industrial engineering research in production systems, 4(9), 257-269.
6) Garaus, Marion; & Treiblmaier, Horst. (2021). The influence of blockchain-based food traceability on retailer choice: The mediating role of trust. Food Control, 129, 108082.
7) Glaser, Florian. (2017). Pervasive decentralisation of digital infrastructures: a framework for blockchain enabled system and use case analysis.
8) Jia, Fu; Blome, Constantin; Sun, Hui; Yang, Yang; & Zhi, Bangdong. (2020). Towards an integrated conceptual framework of supply chain finance: An information processing perspective. International Journal of Production Economics, 219, 18-30.
9) Li, Jian; Zhu, Shichao; Zhang, Wen; & Yu, Lean. (2020). Blockchain-driven supply chain finance solution for small and medium enterprises. Frontiers of Engineering Management, 7(4), 500-511.
10) Omran, Yaghoob; Henke, Michael; Heines, Roger; & Hofmann, Erik. (2017). Blockchain-driven supply chain finance: Towards a conceptual framework from a buyer perspective.
11) Panuparb, Patara. (2019). Cost-benefit analysis of a blockchain-based supply chain finance solution.
12) Taleghani, Mohammad; Sayadmanesh, happiness; and Kaviani, Maitham. (1392). Supply chain financing (SCF) as a new way of financing small and affiliated enterprises (SMEs). The paper presented in the first national conference on the development of monetary and banking management.
13) Wang, Fan; Yang, Xiao; Zhuo, Xiaopo; & Xiong, Minghua. (2019). Joint logistics and financial services by a 3PL firm: Effects of risk preference and demand volatility. Transportation Research Part E: Logistics and Transportation Review, 130, 312-328.
14) Zhu, Liehuang; Wu, Yulu; Gai, Keke; & Choo, Kim-Kwang Raymond. (2019). Controllable and trustworthy blockchain-based cloud data management. Future Generation Computer Systems, 91, 527-535.