

# The Role of Blockchain Technology in Ensuring Digital Transformation for Businesses: Advantages, Challenges and Application Steps <sup>†</sup>

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**Abstract:** In recent years, the concept of digital transformation has emerged as an area where businesses have been working intensively. Digital transformation refers to the holistic transformation of businesses in human and business processes and technology elements in order to provide more effective and efficient services. Therefore, blockchain, which is called a disruptive technology, has great importance in ensuring the digital transformation of businesses. In this study, some determinations have been made about the adoption of blockchain technology and situation analysis while performing digital transformation in businesses. In this context, semi-structured interviews were held with experts in the blockchain field.

**Keywords:** blockchain technology; digital transformation; blockchain advantages and challenges

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## 1. Introduction

Today, as a result of the rapid development of the internet infrastructure, the subject of information technologies has become important for businesses, along with the concept of digitalization. It can be said that technological advances that enable digitalization contribute to the digital transformation of business models. Organizations use internet technologies on a daily basis to move their activities to digital environments. From this point of view, the network created by the businesses benefits from today's technological architecture to create value for their stakeholders. In the digital transformation process, the products produced by the businesses are produced with mechanical and electronic components, which entail the use of complex systems such as hardware, software and data storage [1].

In today's environment, where businesses try to develop more flexible models in the digital transformation process and undergo structural changes, the interactions that occur in the environments of the organizations encourage the phenomenon of organizational change. In the digital innovation and transformation process, businesses have realized that they need to use digital channels to interact with their key stakeholders [2].

While performing this digital transformation, businesses use artificial intelligence, augmented reality, internet of things (IoT), smart contracts, sensors, etc. They make use of many different information technologies. When considered from this point of view, blockchain technology is also one of the basic technologies that businesses can utilize while performing digital transformation.

Primarily, this paper describes the perspectives and challenges regarding the role of blockchain technology in the digital transformation of businesses. Then, some situation

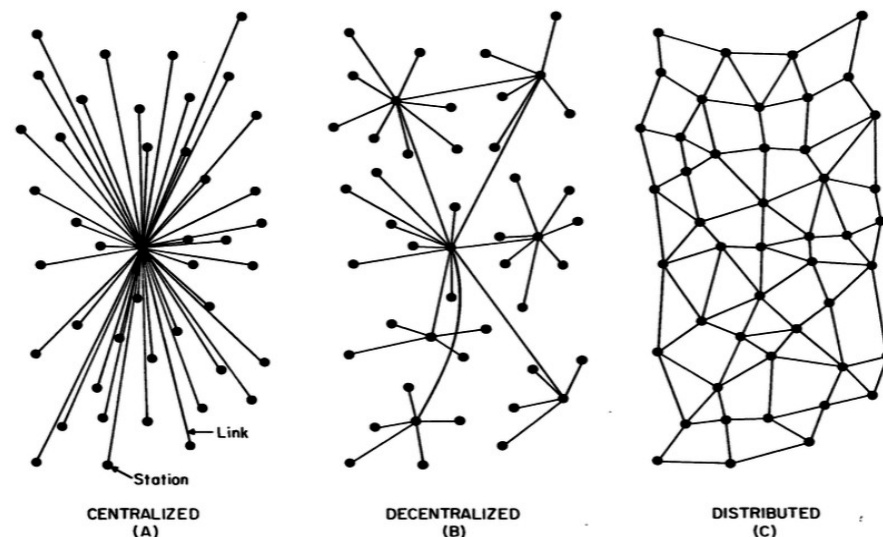
analyses and determinations have been made regarding this issue.

## 2. Literature Review: Blockchain Technology and Digital Transformation

Blockchain technology, which has been mentioned frequently with the emergence of Bitcoin, is a technology that allows for the transfer of data and assets for various purposes and to keep transaction records in a secure digital environment [3].

Blockchain technology is a trust mechanism that emerged without the need for a central authority, using the concepts of mathematics and cryptology. In simple terms, the blockchain structure is treated like a computer network, where computer owners form the basic building blocks of this network structure [4]. That is why blockchain is seen as a breakthrough innovation in decentralized information technology.

As shown in Figure 1, there are three different systems: centralized, decentralized and distributed. Here, the architecture of blockchain technology is included in distributed systems that do not need a central authority. From this point of view, it can be said that blockchain technology will bring important solutions in ensuring digital transformation with its distributed structure.



**Figure 1.** Centralized vs. Decentralized vs. Distributed Systems.

On the other hand, it is stated that digital transformation is to create new business models, processes and systems by using technology to provide more competitive advantages and to achieve higher efficiency [5].

Today, the concept of digital transformation is an issue that is closely related to both the academic and business worlds. The digitalization process gained speed after the industrialization of the fields of education, banking and especially business administration.

It can be said that the integration of digital technologies such as social media, mobile applications, business analytics and cloud-based systems has a transformative effect on information processing. While businesses that have not reached sufficient maturity in the use of digital technology have limited opportunities, businesses with sufficient experience in this field create innovation with digital-based strategies in transformation [6].

Within another study, it is explained that supply chain integration through the blockchain technology can achieve a disruptive transformation of digital supply chains and networks. So, it is found that rapidly developing blockchain technology is a new document exchange solution, and also that its ledger, security and smart contract platforms, as well as software connectors, offer tools to build a cost-effective and flexible network [7].

Blockchain technology has been met with great interest around the world, a particularly its structure, which has been built without being dependent on any central authority. The fact that this technology is an open-source structure helps to design different blockchain platforms, and the reliable operation of the system has enabled many applications such as smart contracts to be designed. In addition to these, blockchain technology has many technical and structural features that can be utilized in realizing digital transformation. These features are included in the study by referring to the current literature. The main features of blockchain technology are as follows:

**Distributed Ledger Technology:** The structure of the blockchain is in the form of a distributed database, and this database is scattered among nodes. The architectural structure of the blockchain allows participants to share a ledger created as peer-to-peer replication in each transaction [8].

**Consensus and Proof of Work (PoW):** Although the concept of Proof of Work has a certain value, it is a difficult piece of data in terms of time and cost. The targeting of these data should be controllable in a simple way. This system is frequently used in blockchain technology [9].

**Decentralized:** In this structure, transactions can be carried out in a distributed structure with the systematic infrastructure provided by blockchain technology, encrypted with cryptography only between the receiver and the transmitter and also independently from any authority [10].

**Peer to Peer (P2P) Network:** Individual nodes allow data to be stored by transmitting data directly to each other in an end-to-end network, without using any central system for the parties to communicate with each other [3].

### 3. Methods

First of all, after the comprehensive literature review discussed within the scope of the research, the advantages of blockchain technology in realizing digital transformation and the situation analysis were evaluated. Then, challenges that may arise in the transition to blockchain technology while performing digital transformation are discussed.

While realizing all these research objectives, one of the qualitative research methods that semi-structured interview was used. In this context, semi-structured interviews were conducted with more than one expert in the field of blockchain.

These results found in the research were evaluated and discussed in the light of the information obtained from the interviews.

#### 3.1. Blockchain Technology Advantages in Digital Transformation

While ensuring the digital transformation, blockchain technology has some advantages and solutions for the businesses. According to the semi-structured interviews with the blockchain experts, the blockchain advantages are as follows:

- Increase event and document reliability
- Build competitive advantage
- Track orders across multiple touch points
- Optimize applications and processes
- Improve productivity per file
- Manage documents digitally
- Access new data sources
- Improve system integrations like IoT, EDI, AI, etc.
- Expand digital collaboration
- Transaction integrity and visibility

#### 3.2. Challenges When Implementing Blockchain Technology in Digital Transformation

The blockchain is called as a disruptive technology, and as we all know that blockchain is also a new technology, there are some challenges in using and applying the

blockchain technology within businesses. According to the semi-structured interviews with the blockchain experts, the blockchain challenges are as follows:

- Scalability
- Privacy and Security Issues
- Transaction and Process Performance
- Software Problems and Cyber Attacks
- Fork Issues
- Encryption and Quantum Computers
- Challenges for Financial Utilization
- Lack of Knowledge and Specialized Human Resources
- Lack of Blockchain Need Analysis for Businesses
- High Investment Cost
- High Energy Consumption
- Lack of Legal Regulations

### 3.3. Blockchain Technology Implementation Challenges and Steps for Businesses

In terms of applying blockchain technology to certain sectors and businesses, some situations can be highlighted, such as managing application and adaptation processes. With the disadvantages of being new in technology and the lack of human resources with sufficient production, businesses should first decide what different and new needs they have for the classical systems workflows. Then, businesses should decide how they can meet these needs by using blockchain technology.

When a business wants to use blockchain technology in its current business processes, there are certain steps and processes. According to the semi-structured interviews with the blockchain experts, the blockchain application steps and processes are as follows:

- First of all, it should be determined in which sector it operates and how many suppliers, distributors and resource users are working within this process or production.
- It should be determined from which suppliers the raw materials required for production or process are procured, which processes they go through and which audits these suppliers are subjected to in which countries.
- Determining which platform (like Microsoft Azure, Ethereum, Hyperledger, etc.) to use and how many users and founders will be included in the network to establish the blockchain network.
- Determining how users will be included in the network or system from a technical point of view.
- How to manage the keys required for accessing to the network, whether an ID infrastructure is needed and where these IDs will be stored.
- In addition, determining in which blockchain infrastructure (on/off blockchain) the data and transactions of the network will be stored in terms of security.
- Determining the network's secret management infrastructure.
- Finally, according to the infrastructures to be used when managing smart contracts, it is necessary to determine which of the proof of work (PoW), Proof of Stake (PoS) and Proof of Authority (PoA) mechanisms will be used.

In addition to these steps, according to the semi-structured interviews with the blockchain experts, there are some other blockchain application steps and processes. These steps and processes are as follows:

- First of all, for a distributed ledger technology that is thought to be designed in the blockchain network, digital identities defined as public or private keys must be determined.
- An ecosystem in which smart contracts, digital identity, peer-to-peer network and distributed ledger technology work in an integrated structure should be created for digital transformation.
- Determining the digital identity management in the network.

- When using the network, in cases where the number of participants and transactions increase in the future, the scalability of the blockchain network should be determined beforehand.
- Determining how to manage smart contracts governance.
- In addition, the transaction amounts and software requirements in the network should be determined comprehensively.

#### 4. Discussion, Conclusions and Future Work

Digital transformation is a comprehensive and disruptive transformation that will affect all operations of businesses, suppliers, customer and employee relations, value chains, business processes, business models, organizational structure, leadership understanding and working styles. So, the importance of the concept of digital transformation is increasing for businesses.

In this context, what is required to prepare a useful digital transformation roadmap is that businesses know what kind of transformation they are targeting. In this study, researches and evaluations have also been made on the role and impact of blockchain technology in performing digital transformation for businesses. Accordingly, as a result of the semi-structured interviews with the blockchain experts, blockchain technology advantages and application challenges are determined for the digital transformation in businesses. Then, the blockchain application steps are determined for the businesses.

According to these results and evaluations, of course the blockchain technology has many advantages for businesses, but there are also some application challenges for businesses which are waiting for solutions. For this type of cases, the businesses firstly determine their blockchain needs analysis and roadmap. They should follow and provide the application steps within the organizations carefully.

For future works, the application of the blockchain technology in smart contracts can be worked on. Smart contracts are one of the most suitable areas in which to implement blockchain technology.

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