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The Effect of the Blockchain on the International Trade

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ABSTRACT

Considering the current and potential opportunities offered by blockchain technology in many areas, it can be understood that how current and future international trade will be affected by blockchain technology will be among the topics of interest. In this context, it is essential to understand the effect of blockchain technology on international trade for institutions that regulate international trade, businesses, academics and others. This study aims to examine the effect of blockchain technology on international trade in a scope (Web of Science, Scopus, Science and Direct databases) that has not been previously examined in the international literature. As a result of this research, it has been understood that the studies in the literature have many effects of blockchain technology, such as cost reduction in international trade, delivery times, performance, facilitation, data security, information sharing and documentation, reliability of the international commercial credit evaluation system, practices, policies and strategies. In addition, in some studies, it has been determined that there are suggestions on how blockchain technology can be used in international trade, such as a blockchain-based letter of credit trading process and a blockchain-based logistics platform. This study is expected to provide useful information to explain the impact of blockchain on international trade.

Keywords: Blockchain, Digitalization, International Trade

1. INTRODUCTION

Closely linked to the evolution of multinational trade between countries, the world economy can be in good shape, countries can achieve their economic development goals, and faster economic progress can be achieved (Okenna, 2020; Vijayasri, 2013, p. 111). Taking advantage of technologies such as blockchain technology, which are the benefits of technological progress, can effectively reshape international trade. Digital technologies and platforms can provide solutions to the problem of distance, cost, time, and make coordination, efficiency and agility more effective (Lund et al., 2019).

Blockchain can enable the parties in the blockchain system to perform all their work in a reliable, secure, traceable, transparent and decentralized manner and to store them in the digital ledger (Golosova & Romanovs, 2018; Pahl et al., 2018, p. 105; Rawat et al., 2021, p. 4). Blockchain technology is one of the essential technologies for those who aim to be successful in international trade with the innovations it offers in international trade (Siddik et al., 2021, p. 232). Changes in international trade and technological innovations can be considered essential factors affecting each other. Inevitably, events with a global impact (pandemic, conflicts between countries, inflation, etc.) will affect international trade. Technological innovations and changes can help businesses to find solutions to uncertainty and problems.

Technological innovations can be effective in various ways in international trade, as in many areas. Various studies have been conducted in the literature on the relationship between international trade and technological innovations and developments. Among the studies carried out are the effect of international trade on the choice of technology (Gong & Zhou, 2022), the optimal design of international trade logistics based on IoT technology (Y. Wang, 2022), the impact of blockchain on foreign trade with sample projects, applications, etc. (Benli & Yaman, 2021; Civelek & Özalp, 2018; Özyüksel & Ekinçi, 2020; Tüfenk, 2023; Vurdu, 2021; Yılmaz, 2023), international trade, technology and skills premium relationship (Burststein & Vogel, 2017), technology diffusion and international trade network relationship (Ferrier et al., 2016; Haruna et al., 2010; Keller, 2010; Nabeshima et al., 2018; Parrado & De Cian, 2014), international trade and green technology progress relationship (Cao & Wang, 2017), international trade, technology innovation and environmental sustainability relationship (Ali et al.,

2021), the impact of information and communication technologies on international trade (Abeliansky & Hilbert, 2017; Chung et al., 2013; Nath & Liu, 2017; Ozcan, 2018; Soosai Manickam et al., 2021; Thiemann et al., 2012; Yushkova, 2014), the impact of the Internet on international trade (Freund & Weinhold, 2004), the impact of international trade on R&D investments (Li et al., 2011; Parameswaran, 2010).

This study aims to examine the effect of blockchain technology on international trade in light of studies in the international literature. For this purpose, in this study, international trade is first mentioned, and then blockchain is explained. Afterwards, blockchain's effect on international trade was mentioned within the scope of Web of Science, Scopus, Science and Direct databases. Finally, the study's results, limits and recommendations are mentioned in the conclusion section.

2. INTERNATIONAL TRADE

Grozdanovskaa et al. (2017, p. 105) define international trade as “the exchange of goods, services and capital across international borders or territories”. Heakal (2022) also states it as “the purchase or sale of products by institutions in different countries”. Furthermore, Terzea (2016, p. 244) states that international trade is a “bridge” between nations, and this situation will continue in the future. International trade theories are basically divided into two groups. These are referred to as “country-based or classical theories” (e.g., mercantilism, hecksler-ohlin) with a focus on economic growth, which deals with the fact that the priority should increase the nation’s own wealth, and “firm-based or modern theories” (e.g., global strategic rivalry) that address the needs of businesses, established by various business school professors (Pant, 2022).

International trade has a significant impact on national economies. Businesses are trying to seize opportunities and expand their businesses outside the borders of the country they are in. It is inevitable to turn to foreign markets in order to avoid dependence on existing markets. With international trade, customers in different countries can access a wide range of products, quality and prices (Surugiu & Surugiu, 2015, pp. 131-132). International trade makes it possible to develop competition, deliver products with more affordable prices and higher quality to consumers, transfer technology, and reach an advanced level in technology. Production, consumption, investment, employment numbers and capital movements can be positively affected by international trade, while economic development can be achieved (Grozdanovskaa et al., 2017, p. 113; Lv, 2016).

Today, some of the international trade trends and developments are as follows (Nekhoroshkov et al., 2021, p. 183):

- ✓ Developing the list of nations called "super-trading countries whose external trade quota exceeds 100%"
- ✓ Evolution of “international offshore production systems”, “value chains”, “outsourcing”, etc.
- ✓ “Product diversification”, “intra-company trade” and “intra-industry trade” are becoming more essential
- ✓ Maintaining the structure of international trade in terms of “macrostructure”
- ✓ Ensuring more significant participation of developing nations in global value chains, expanding the share of emerging markets and countries and these countries starting to play an important role
- ✓ Increasing the share in exports of enterprises that are more disadvantaged compared to their competitors and have not been able to become large enterprises
- ✓ Reduced flexibility of international trade with the growth of the international economy

Figure 1 includes the world merchandise trade volume change forecast, according to the United Nations Conference on Trade and Development (UNCTAD), World Trade Organization (WTO) and WTO Secretariat estimates.

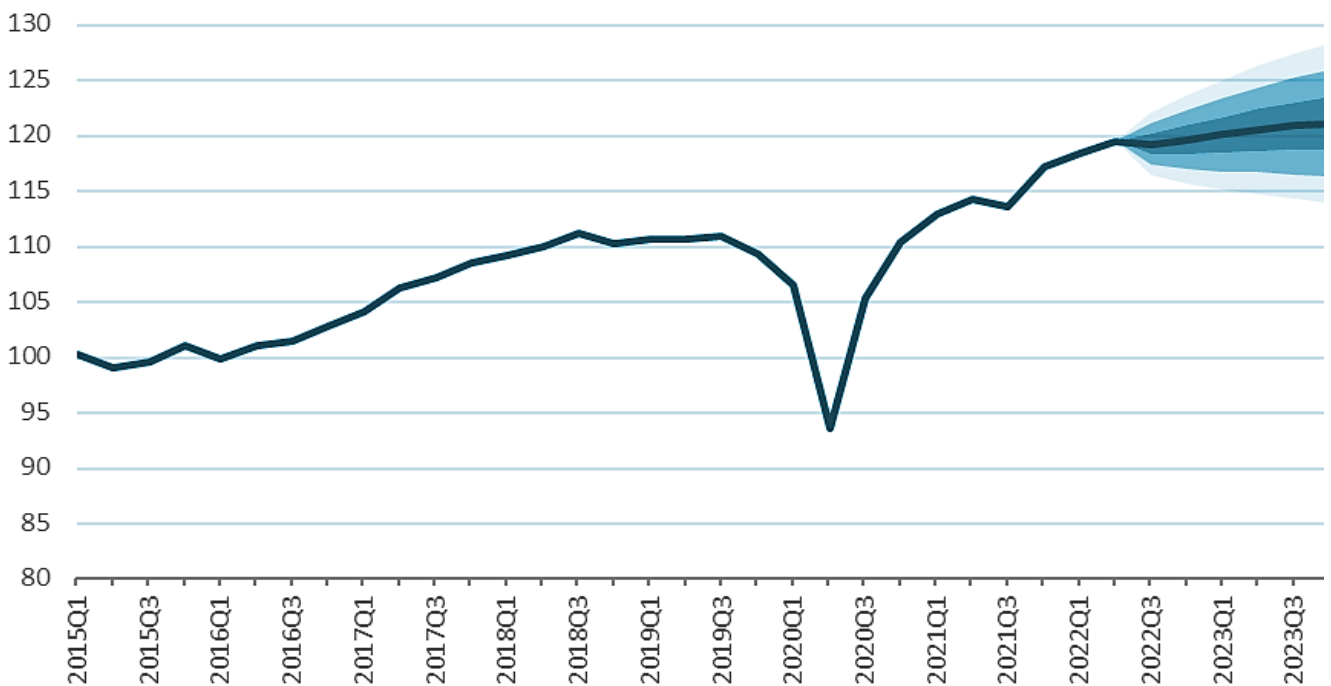


Figure 1. World merchandise trade volume change forecast, 2015Q1-2023Q4

Note: Each shaded area corresponds to a standard error band of ± 0.5 around the center forecast, seasonally adjusted volume index, 2015=100

Source: (WTO, 2022)

Although world trade started to decline with the effect of the pandemic process, it was able to return to a positive course with the decrease of the effect of the pandemic. However, this positive progress is due to conflicts between some countries, unpredictable increases in inflation, energy prices, etc. may also have a positive course at a low rate. According to WTO economists, it is estimated that the global goods trade volume will increase by 1% in 2023. In addition, in the case of downside risks, it is estimated that the trade growth in 2023 may be as low as -2.8%, and in the case of positive developments, the trade growth may be as high as 4.6% (WTO, 2022). Considering these data, which include the risks and growth rates of international trade, it is clear that the benefit of technologies such as blockchain, which can affect international trade positively, albeit partially, should not be ignored.

Technological innovations and digitalization, which are developed and being developed today, have important effects on international trade. Among them are many effects such as faster development, convenience in processes, providing speed, reducing costs, positively affecting productivity, and increasing the number of participants (Abeliansky & Hilbert, 2017; Ahmedov, 2020). With the support of these technologies, current conditions and opportunities in international trade can become more advantageous.

3. BLOCKCHAIN

Blockchain was first conceptualized by the pseudonym Satoshi Nakamoto, who has yet to be revealed. Blockchain was exploited as the core component of Bitcoin in 2009. Although blockchain technology and the cryptocurrency bitcoin are thought to mean the same thing, they are different. Bitcoin benefits from the infrastructure of blockchain technology (Ganne, 2018, p. 3; Habib et al., 2022, p. 2).

Thanks to blockchain technology, various transactions with a decentralized structure can be stored in the blockchain by utilizing the distributed digital ledger technology (Rawat et al., 2021, p. 4). Huang et al. (2019, p. 553) describe blockchain as “a chain of 'blocks' created by different nodes (a computer or server representing the members or users of the chain).” Hayes (2022) defines blockchain as “a distributed database or ledger that is shared among the nodes of a computer network”. Figure 2 shows the blockchain process.

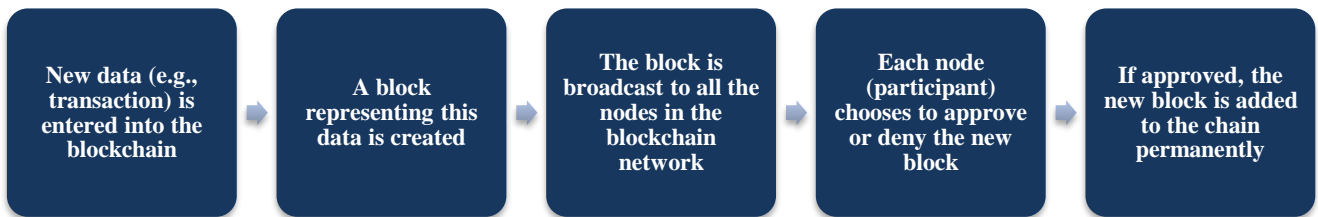


Figure 2. Blockchain process

Source: (Rodríguez Cruz, 2022)

In the blockchain process, data is stored in blocks and linked together to form a chain. When blocks with a certain capacity are filled, they are closed and connected to the previous block. The newly added information after the last block is compiled into a newly created block and added to the chain after filling it (Budhi, 2022).

There are four general classifications of blockchain. These are (Khan et al., 2022, pp. 2-3; Maheswari et al., 2020, p. 230):

- ✓ “Public Blockchain”: It is a blockchain classification where data and access are available to everyone.
- ✓ “Private Blockchain”: It is a blockchain classification that can only be controlled by authorized users or selected institutions.
- ✓ “Consortium Blockchain”: It is a blockchain classification consisting of several organizations and consortia, in which the procedures in a consortium are established and controlled by pre-assigned users.
- ✓ “Hybrid Blockchain”: It is a blockchain classification that includes a hybrid of private and public blockchain. It allows users to set the rules for what actions can be taken in the permissionless ledger, while the permissioned ledger allows the rules to determine how the restrictions and privacy will be applied.

Blockchain has development stages from 1.0 to 4.0. Figure 3 shows the stages of blockchain development.

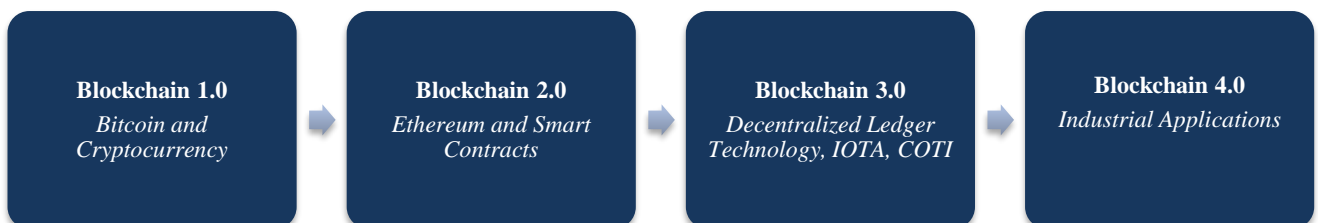


Figure 3. Blockchain development stages

Source: (Dubey, 2021)

In Blockchain 1.0, the development of the traditional money system is provided. When it comes to Blockchain 2.0, Ethereum and smart contracts (to make contracts more safe and easier) have been included. In Blockchain 3.0, its impact on the market and the economy is at the forefront. Various problems for cross-chain transactions have been resolved in this generation. Decentralized Ledger Technology, COTI and IOTA have been introduced. In Blockchain 4.0, security insurance includes a step that helps Industry 4.0 with increased privacy. Solutions and approaches are introduced for businesses and industries, ensuring seamless integration between different platforms (Dubey, 2021; Mukherjee & Pradhan, 2021, pp. 37-42).

Blockchain technology can offer new possibilities for activities done, provide time advantage, reduce costs (without the need for intermediaries), reduce current and potential risks, provide a more reliable (through improved verification), more open, and more efficient environment (Aydoğan & Aydemir, 2022, p. 659; Hayes, 2022; Javaid et al., 2022; Weking et al., 2020). Considering that while technologies bring important opportunities, they also carry some risks, it can be understood that providing these opportunities of blockchain technology in a safer and healthier environment can positively affect the demand for technologies such as blockchain.

4. BLOCKCHAIN'S EFFECT ON INTERNATIONAL TRADE

Blockchain technology has various effects on international trade. These include the effect on the cost of international trade, its effect on its financing, its effect on supply chain visibility, logistics and transportation processes, its effect customs procedures, certification, fraud and so on (Ganne, 2018, p. 17; Sun et al., 2022; Valeria et al., 2022, p. 102). Considering these effects of blockchain on international trade, it is understood that the scope of its impact on international trade is wide and has the potential to expand.

According to the results of an analysis by Gartner (2018), the business value added by blockchain technology is projected to reach \$360 billion in 2026 and over \$3.1 trillion in 2030. Figure 4 shows the current and projected impact of blockchain on business value.

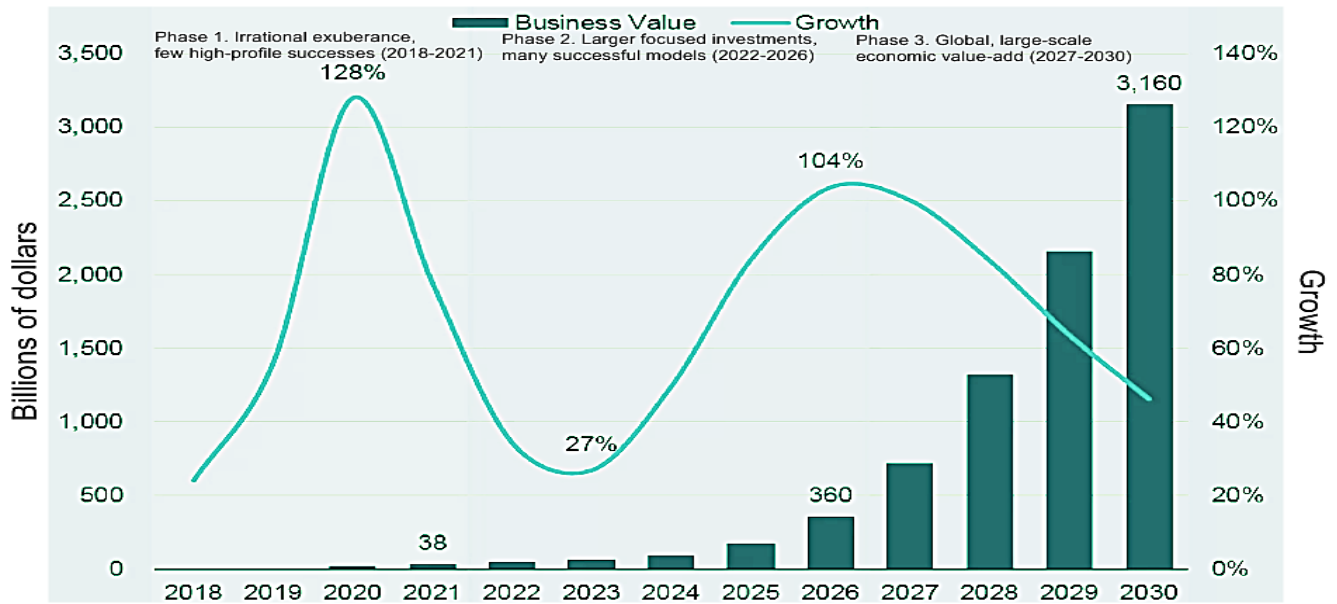


Figure 4. Current and projected impact of blockchain on business value
Source: (Gartner, 2018)

According to Gartner (2018), blockchain technology provides new ways for “value exchange”, “represent assets”, and “implement trust mechanisms” with the opportunities it offers.

The effect of blockchain technology on international trade has been examined in the light of studies in Web of Science, Scopus, Science and Direct databases. Blockchain technology has significant benefits in international trade and can play an essential role.

In some studies, the effects of blockchain on international trade practices, policies and strategies have been examined in general (Cai & Cortelazzo, 2023; Carey et al., 2019; Derindag et al., 2020; Wang, 2018).

In some other studies, there have been studies that suggest how blockchain technology can be used in international trade. These studies include a blockchain technology-based letter of credit (Toorajipour et al., 2022), a blockchain-based letter of credit trade process (Chang et al., 2019), a blockchain-based logistics platform (Chen et al., 2021), a new traceability system based on blockchain networks and RFID tags (Bordel et al., 2019), a IoT blockchain based diamond international trade design (Mathew et al., 2019), a blockchain-enabled architectural framework for sustainability communication (Cao et al., 2023). Significant gains can be achieved in a letter of credit and letter of credit based on blockchain technology that uses the capabilities of smart contracts and information technologies. With blockchain technology, commercial transactions can be more independent, transparent, fast and secure (Alsalmim & Ucan, 2023; Chang et al., 2019; Harris, 2021; Toorajipour et al., 2022). Blockchain can enhance the efficiency of current supply chains and improve trading patterns and markets by providing comprehensive insights into distinctive goods (Allen et al., 2019). Fridgen et al. (2021) carried out three design cycles and developed three artefacts (blockchain-based business process optimization, blockchain-based business process disruption, and blockchain-based business process re-engineering) in their study. Blockchain technology can also make sustainability communication more traceable, verifiable and reliable (Cao et al., 2023). Bordel et al. (2019) proposed a new traceability system for food products based on blockchain networks and RFID tags. They concluded that the success rate was 100% until the number of readers in the system reached 1800 for traceability in international trade. Harris (2021) concluded that blockchain effectively minimised the impact of fraud in bills of lading and letters of credit and suggested a framework based on Hyperledger Fabric. It is also important to ensure stability in international trade. In the study by X. Wang (2022), the currency issuance system based on blockchain technology was designed and tested for stability in international trade, and as a result, it was understood that the digital currency is important. Using blockchain technology for traceability helps producers and agribusinesses communicate their commitment to sustainability and the credentials of their products in a trustworthy way (Cao et al., 2023).

In some studies in the literature, the effect of blockchain on international trade has been empirically and experimentally examined (Balci & Surucu-Balci, 2021; Lian, 2022a, 2022b; Siddik et al., 2021; Weerakoon & Chandanie, 2021; Yoon et al., 2020; Zhang & Fan, 2022). In these studies; Siddik et al. (2021) analyzed with the generalized linear model and cointegration tests using time series world data for 2009-2018. As a result of the analysis, they concluded that blockchain positively affects international trade with its accelerating and facilitating effects. In the analysis performed by Lian (2022b), using the data of five qualified commercial banks, it was concluded that the international commercial credit evaluation system based on the "blockchain technology" and "grey correlation model" created in the study has high reliability. Another study by Lian (2022a) examined the application of blockchain in the international trade big data system, introduced the distributed network architecture and analyzed its performance. This experimental research concluded that the decentralized data manager has more processing performance efficiency than the centralized data manager. In this study, it has been understood that blockchain technology can provide better data security, better risk management, speed up business processes, and positively affect transparency. Balci and Surucu-Balci (2021) examined the adoption of blockchain in containerized international trade. As a result of the analysis they made using stakeholder mapping and interpretive structural modeling, they determined that the highest among the stakeholders are container lines, ports, beneficial cargo owners, freight forwarders/third party logistics, and customs authorities. They concluded that understanding blockchain, supporting effective stakeholders, and government regulation can improve adoption. Zhang and Fan (2022) state that the evaluation of the application of blockchain technology by the analytical hierarchy process method has a significant good effect on the commercial payment and supply chain. As a result of their simulation and numerical analysis, Yoon et al. (2020) concluded that blockchain can be beneficial for businesses dealing with significant demand volatility in international trade, with its effects such as reduced delivery times and reduced costs, and can make businesses more active. In their research, Weerakoon and Chandanie (2021) concluded that blockchain technology can provide solutions to problems such as information sharing, transparency, documentation, costs and delays in payments in the international trade of the construction industry. Studies reveal the importance of utilizing blockchain technology for the development of the international trade process.

5. CONCLUSION

In this study, the effect of blockchain technology on international trade is examined in a scope (Web of Science, Scopus, Science and Direct databases) that has not been previously examined in the literature. By using blockchain technology in international trade, faster, more transparent, more secure, traceable, more advanced communication, decentralized structure, reduced costs and errors and similar opportunities can be achieved (Gutierrez, 2016; Mukewar, 2022). It is clear that it can be beneficial to benefit from the current and possible opportunities provided by blockchain technology with an optimistic approach for businesses, institutions and others involved in the international trade process, which feels the impact of global pandemics, inflation and other problems.

As well as the possibilities blockchain technology offers, some disadvantages need to be developed. These include the applicability of the technology, the costs, the regulations, the support of local governments, the need for more processing than traditional databases, the rewriting of codes in all blocks in case of errors, and so on (Budhi, 2022; Golosova & Romanovs, 2018). By emphasizing the disadvantages of blockchain technology for international trade, it can be predicted that an increase in the demand for blockchain technology in international trade and expansion in its application area and scope can be achieved if solutions can be brought.

As a result of the examination carried out in this study, it has been understood that studies in the literature are about many effects of blockchain technology such as the ones on facilitating international trade, improving performance, reducing costs, lead times, improving data security, information sharing and documentation processes, improved traceability, reliability of the international commercial credit assessment system, other practices, strategies and policies in international trade and so on (Allen et al., 2019; Alsalmim & Ucan, 2023; Bordel et al., 2019; Cai & Cortelazzo, 2023; Cao et al., 2023; Carey et al., 2019; Chang et al., 2019; Derindag et al., 2020; Fridgen et al., 2021; Harris, 2021; Lian, 2022a, 2022b; Siddik et al., 2021; Toorajipour et al., 2022; Wang, 2018; Weerakoon & Chandanie, 2021; Yoon et al., 2020). It has been determined that the studies in the literature are mostly articles and conference papers, and there are few empirical and experimental studies yet. It is thought that the literature on the subject can be enriched even more with the increase in the number of empirical and experimental studies and the increase in the number of studies in the type of book study. In light of the studies, strategic planning for the acquisition and optimal use of blockchain technology can be beneficial to be done now, taking into account the current and potential opportunities of blockchain technology in international trade.

It is important to carry out studies that explain the effects and benefits of using blockchain technology in the international trade process in terms of increasing the use of blockchain technology in international trade. It is predicted that this study will provide useful information to managers and employees in institutions dealing with international trade and those considering doing academic studies. The limitations of this study are that it was conducted within the scope of Web of Science, Scopus, Science and Direct databases and that it included the period in which the examination was conducted. In this study, the effect of blockchain technology on international trade has been examined in light of the studies in the literature. In future studies, the research can be repeated by including different indexes, and the effect of blockchain on international trade can be examined comparatively in different countries and sectors.

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