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Araştırma Makalesi ● Research Article

Evaluating Research Trends on The Emerging Blockchain Technology In The Fields of Business And Management: A Systematic Review

İşletme Ve Yönetim Alanlarında Gelişmekte Olan Blok Zincir Teknolojisine İlişkin Araştırma Trendlerinin Değerlendirilmesi: Sistematik Bir İnceleme

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ÖZ

Blokzincir teknolojisi, internetin icadından sonra en yıkıcı ve devrim niteliğindeki yeniliklerden biri olarak kabul edilmektedir. Blokzincir teknolojisi iş dünyasında her geçen gün önemli bir yer edinmeye devam etmektedir. Bu teknolojinin gelişimi ağırlıklı olarak akademik çalışmalarla ortaya konulmaktadır. Bu çalışma, Web of Knowledge, Scopus ve Google Scholars veritabanlarında belirli bir dönemde yayınlanan iş/yönetim odaklı blockzincir teknolojileri ile alakalı yapılmış çalışmalarının sistematik bir incelemesini sunmaktadır. Bulgular, konuyla ilgili çalışmaların 2018 yılından sonra arttığını, Almanya ve ABD başta olmak üzere dünyanın birçok ülkesinde bu konu üzerinde durulduğunu ve blokzincir teknolojisinin yenilik yönetimi, tedarik zinciri yönetimi, finansal yönetim, kaynak yönetimi, kimlik yönetimi alanlarında yoğun bir şekilde kullanıldığını göstermektedir. Bu çalışma ile işletme yönetimi alanında gelecekte yapılacak çalışmalar için bütüncül bir çerçeve çizilerek, önerilerde bulunulmuştur.

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ABSTRACT

Blockchain technology is considered to be one of the most disruptive and revolutionary innovations after the invention of the internet. Blockchain technology continues to gain an important place in the business world day by day. The development of this technology is mainly demonstrated by academic studies. This evaluation conducts a systematic review of business/management-oriented blockchain studies published in a certain period of time in the Web of Knowledge, Scopus and Google Scholars database. The findings show that the studies on the subject have increased after 2018, there are studies on the subject in many countries of the world, especially in Germany and the USA, and blockchain technology is intensively discussed in the innovation management, supply chain management, financial management, resource management, identity management. Additionally, some suggestions have been made in the field of business management for further future studies.

1. Giriş

The term "blockchain" is thought to have first appeared in the 1990s. The first work on cryptographically secure blockchains was described in 1991 by Stuart Haber and W. Scott Stornetta (Morkunas et al., 2019). Blockchain, which can also be described as a distributed ledger, is basically a data storage approach in which more than one party reaches an agreement among themselves, reduces errors, and saves the transaction on different databases and ensures that it cannot be changed. Blockchain technology, popularized along with the Bitcoin virtual currency, can be applied to

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various fields such as healthcare, insurance, identity management, smart energy grids, logistics and supply chain management (Lee, 2019; Martinez, 2019; Kızıldağ et al., 2019; Tiscini et al., 2020).

It is crucial to determine which Blockchain-related subjects have already been examined and addressed, as well as which ones now pose the greatest difficulties and restrictions and demand more research. We choose to employ a methodical mapping study technique to find pertinent Blockchain-related articles in order to get answers to these queries. We used a carefully thought out research methodology to look for information in academic databases for the systematic mapping investigation. The created map of existing Blockchain research will aid other academics and practitioners in determining potential study topics and questions for upcoming studies.

Although Blockchain are also the technical perspective like cryptocurrencies, we decided to narrow down the research topic to a business and management. This research aims to analyze and synthesize the articles that deal with business and management viewpoints on blockchain technology.The scope of the research consists of 48 aticles published in Web of Science, Google Scholar, Scopus database. In accordance with the purpose of the research, the following steps were followed:

- Development of research methodology
- Scanning the relevant electronic database
- Searching for answers to research questions
- Synthesizing Blockchain studies in academic literature

We selected systematic analysis as the research methodology for this study. Systematic analyses are secondary research studies in which randomised controlled studies are collected and synthesised. In order for a study seeking an answer to a research question to be called a systematic analysis, the process of identifying the studies to be used, choosing them meticulously, and synthesising the outputs must be done in a systematic, transparent and reproducible manner. Correctly done systematic analyses create reliable evidence in research (Ata &Urman, 2008).

According to the PRISMA method shown in Figure 1, the total number of studies obtained by database scanning is 48. The sample was reached by using Google scholar, Web of Science, Scopus databases. The keywords of blockchain technology and business management. After eliminating the repetitions, and articles that focus on Computer Science and deep technical topics and do not pay attention to business management and organizational contexts were excluded from this research. Appendix 1 contains the complete list of the chosen papers as well as some of the data items that were extracted.

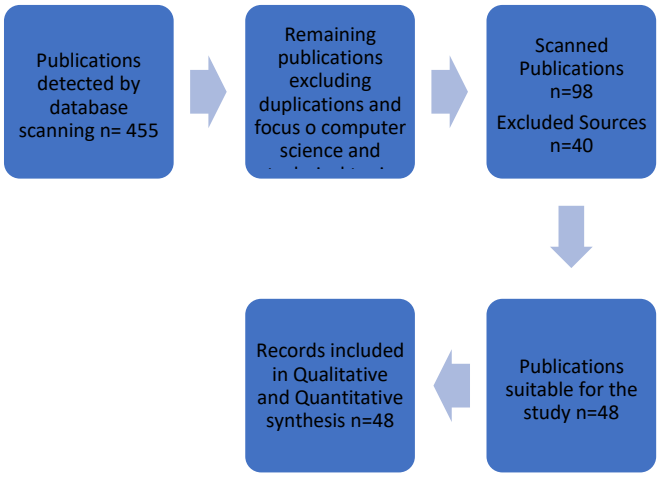

Figure 1: Flowchart of Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA)

Source: Moher et al. 2009)

In accordance with our goal, we defined the following four research questions (RQs) as the first procedure in the systematic mapping study:

RQ1: How does the business literature define blockchain technology structure?

RQ2:What are the dominant theoretical lenses underlying of blokchain technology?

RQ3: What are the dimensions focused on blockchain technology?

RQ4: What are the finding of blockchain technology related research articles?

2. Systematic Analysis Of The Blockchain Technology

2.1. Basic Information about the Articles

In the articles reviewed, the journals publishing articles on blackchain technology most frequently and the number of articles are as follows:

Table 1: Journals Publishing Articles On Blackchain Technology

Journals List	*Number Of Articles*
Transaction On Engineering Management	6
Journal Of Business Logistic	4
Business Process Management Journal	3
İnformation System And Business Management	2
Marketing And Management Of İnnovations	2
İnternational Journal On Organizational Analysis	2
Journal Of Global Operations And Strategies Sourcing	2
Supply Chain Management An İnternational Journal	2
Technology İnnovation Management Review	2

Countries conducting these studies most and the number of articles:

Table 2: Distribution of the papers by the countries of the research studies

Countries	***Number of Articles***
Germany	12
USA	5
UK	3
South Korea	3
Denmark	2
India	2
Sweden	2

The dimensions taken into consideration in the context of blockchain technology in these studies as follows:

Table 3: Dimensions of Blockchain Technology

Blockchain Technology	Innovation Management
	Supply Chain Management
	Human Resource Management
	Technology Entrepreneurs
	Identity Management
	Financial Management
	Resource Management
	Business Model And Network
	Sustainability Management

The significant outcomes of these articles can be summarized as:

Table 4: Outcomes of Blockchain Technology

Blockchain Technology	Reduce Workload
	Improve Visibility
	Traceability And Trust Network
	Increase Business Value And Competitiveness And Sustainability
	Decrease Security Problem
	Self-Sovereignty
	Optimization
	Interoperability
	Transparent Data Production And Consumption

The research methods and numbers of the articles examined in this study are as follows:

Table 5: Research Methods

Research Methods	***Study Numbers***
Case Study	12
Explanatory	10
Systematic Review	10
Statistics	9
Interview	3
Delpi Study	2
Theoretical Framework	2

2.2 Discussion of Research Questions

2.2.1. How Does The Business Literature Define Blockchain Technology Structure?

Blockchain is a decentralized and distributed transactional database technology. In a more technical expression, it is a distributed database technology that combines all records (blocks) into an inseparable chain and stores them starting from the first block. First, Bitcoin cryptocurrency started to use this technology. Although the history of blockchain technology is much older, the interest in this technology has increased significantly with the invention of Bitcoin in 2008. The interest in blockchain technology stems from its decentralized features. These are the security, transparency of transactions and ensuring data integrity without any third party control of transactions.

Although there is no single and basic definition for blockchain technology, the following definition Table 6has been designed in the light of the 48 articles systematically reviewed.

Table 6: Definition of Blokchain Technology

Definition Of Blokchain Technology	Distributed or Decentralized Ledger
	Trust, Security and Transparency
	Chain of Blocks
	Peer-to-Peer
	Infrastructure
	Value Transfer
	Disruptive Technology
	Bitcoin or Cryptocurrency Specific References

Also, there are five important elements on which blockchain technology is based the following Table 7 has been designed in the light of the 48 articles systematically reviewed.

Tablo 7: Elements and Types of Blokchain Technology

Elements Of Blokchain Technology	Distributed Database Structure
	End-to-end communication
	Pseudonymity
	Unrevisability of Records
	Computational logic

2.2.2. What are The Dominant Theoretical Lenses Underlying of Blokchain Technology?

The main theories that have been determined from the 48 articles included in this study are:Transaction Cost Theory,

The Resource-Based View, Information theory, Technology acceptance model, Network Theory, Innovation Diffusion theory, Agency theory. These theories are briefly explained below:

- ***Transaction Cost Theory:***It is widely accepted that the foundations of the transaction cost theory were laid out by Coase (1937) and developed by Williamson, who published his book "Market and Hierarchies" in 1975. The main discussion of transaction cost theory is based on governance mechanisms aimed at minimizing transaction costs. Governance mechanisms emerge in three different forms: market, hierarchy and hybrid (their mixture). Accordingly, when organizations choose between alternative governance mechanisms, they make this choice largely according to which one minimizes the transaction cost. Transaction cost theory is a fundamental theory for operations, purchasing and supply chain management.Many company utilizes the transaction cost theory to gain preliminary insights on how blockchain can affect the future of supply chain relationships since blockchain is a driving force behind digitalization in purchasing and supply chain management. The transaction and governance costs of supply chain transactions may be greatly reduced via blockchain technology.
- ***The Resource-Based View:***Its departing question is how organizations manage their relationships with their external environment, starting with the question of why some organizations are more successful than others. The purpose of the theory is to explain how organizations maintain their own, sustainable positions in competitive environments. The theory focuses on efficiency-based resources rather than other ways organizations can differentiate themselves from their competitors, such as market power, collusion, or strategic behavior. Accordingly, organizations that have superior or distinctive resources and capabilities compared to their competitors gain competitive advantage if they manage environmental opportunities correctly. The relationship between resource-based theory and blockchain technology has been discussed by researchers with a focus on integration into supply chain systems and performance. Blockchain technology affects the performance of supply chain activities in terms of cost reduction, delivery time reduction, process control, flexibility.
- ***Information theory:***The goal of the theory is to identify and investigate the mathematical principles that control how data behaves during transmission, storing, and retrieval. Information theory was developed by Claude E. Shannon to find the constraints of signal processing operations such as data compression, storage and transmission in a secure environment.Information theory examines how information is sent, processed, extracted, and used; this information can be viewed of as the eradication of uncertainty. It is possible to assess the competitiveness of private versus public supply chains in a blockchain environment using information processing technology.The customer has more access to provenance knowledge thanks to blockchain technology. The requirement for an assessment of information processing skills is highlighted by information theory.
- ***Technology acceptance model:***It was developed by Davis F. in 1989 with the aim of promoting the adoption of technology. Davis' model has the feature of being the most frequently used model in studies conducted on the utility of information systems (Venkatesh, 2000). Technology Acceptance Model (TAM) tries to reveal people's attitudes towards information systems, how they use these systems and their behaviors in these system as well as to explain the role that information systems would play in human life in the future. The purpose of the Technology Acceptance Model (TAM); with the least variables, to solve the factors affecting the behavior of information systems users and their adoption of technology with a theoretically validated model. TAM and the acceptance of blockchain technology depends on a number of variables, including perceived usability, firm readiness, subjective norms, level of awareness, perceived utility, and attitude toward actual system usage.
- ***Network Theory:***Theoretically, networks can be used to analyze graphs that show systems with distinct items, with the connections between the objects indicating how they interact. These types of graphs are frequently used in the finance industry, for instance, to comprehend financial flows and the interconnection of central counterparties. Also, statistical and particle physics, computer science, electrical engineering, biology, economics, finance, operations research, climatology, ecology, public health, sociology, and neuroscience are just a few of the fields where network theory is used. This theory is used in data analysis by finding relationships between data and extracting their true values using graphical models in the functionality of blockchain technology.
- ***Innovation Diffusion Theory***: One of the earliest social science theories is E.M. Rogers' Diffusion of Innovation Theory, which he created in 1962. According to the innovation diffusion theory, possible users decide whether or not to adopt an innovation based on beliefs that they create about the invention. The innovation diffusion theory aims to describe the innovative decision-making process, the factors that influence adoption rate, and the various adopter types. It aids in estimating the likelihood and rate of an innovation's adoption.
- ***Agency theory:*** The notion of agency theory is used to understand and address problems in the connection between corporate principals and their agents

Blockchain technology creates the infrastructure for decentralized network governance, enabling the removal of internal and external monitoring mechanisms used to resolve controlling issues in corporate governance.Blockchain technology increases the efficiency in the agency relationship and reduces agency costs.

2.2.3. What are the Dimensions Focused on Blockchain Technology?

The opportunity that blockchain technology provides to digital identity makes it the essential part of the trust economy. Thus, blockchain is not only limited to the financial sector; instead digital technologies also offer various opportunities for business world. In this respect, it is argued that blockchain technology sits at the center of the fourth industrial revolution. It has potentials in various areas such asreliable and trustworthy information sharing between different governments or private institutions, supply chain management, record verification, banking transactions, distribution, monitoring and proper use of social benefits and donations, cloud storage, making credit reports accurate, transparent and accessible, increasing cyber-security, electronic voting, transformation of public records and services such as health, population, voter information, driver's license, judicial services, background investigation in human resources management, ability to manage personal information of individuals themselves, smart digital contracts, copyright management, patient database management (Sivula et al. 2021; Dierksmeier and Seele, 2020; Hopper and Holtbrugge, 2020; Schneider

et al., 2020; Ozdemir et al, 2020).

In the articles examined, supply chain management is the most frequently studied area. With the application of blockchain technology in the supply chain, every stage of a product, from manufacturing to sales, can be documented by creating a permanent product history. The supply chain acquires an autonomous structure and human errors are minimized. Thus, it is emphasized that a reliable, sustainable and less costly structure could become the part of the supply chain thanks to blockchain technology. Another important variable group can be listed as financial tools, financial management, digital assets. As stated in the articles reviewed, Blockchain technology has acquired recognition with the popularization of Bitcoin in the financial sector (Rajnak and Puschmann, 2020) Numerous reasons like costs of brokerage activities, transaction limits, etc. render Bitcoin and its derivativesattractive to use. In addition, users could access full control over their own commercial transactions and information. These authorized users can obtain information in a more transparent environment thanks to the block chain structure, and while doing this, the data would not be subjected to some threats. All these construction businesses lead to the active use of blockchain technology (Rijanto, 2020; Mosteanu and Faccia, 2020; Alles and Gray, 2020; Lee, 2019).

As stated in the articles reviewed, the concepts of traceability and sustainability, very important concepts for business process management, have gained a new breath with blockchain technology. Blockchain provides a valid and effective way of measurement of key supply chain processes, results and performances. Input tracking data is immutable if they are recorded in a blockchain ledger. Other suppliers in the chain can also track shipments, deliveries and progress. In this way, blockchain builds trust between suppliers. In terms of sustainability, it is seen that consumers focus on environmental factors, and companies share information about the environmental effects of their products in this direction (Kopyto et al. 2020; Bag et al. 2021; Mishra and Venkatesan, 2021; Milani et al. 2021; Aslam et al. 2021; Bhatti et al. 2021).

According to this viewpoint, the recently created blockchain technology ought to be incorporated into business procedures as a crucial element in generating security, distribution, openness, cost effectiveness, and most crucially trust. The revolutionary business process known as Industry 4.0, which works in this direction by putting current technology to use, sees raising levels of automation, trust, and transparency as its main objective (Batwa and Norman, 2020; Dierksmeier and Seele, 2020).

2.2.4. What Are The Major Findings Of Blockchain Technology Related Research Articles?

Although the blockchain revealed its initial impact on the field of financial products and services and was often referred to as Bitcoin in the past, it effects virtually all sectors today. The year 2018 has witnessed that the approach of companies to Blockchain technology has changed, with the majority of them conducting research on Blockchain technology and working on its application areas. Blockchain technology could pave the way for redesigning costly and inefficient processes, leading to more visionary systems that can touch more people more directly.

Another prominent development in the blockchain ecosystem is the consortia designed to include different parties. In addition to large and small-scale companies, the number of consortia formed by academia and some non-profit companies is increasing. Once the consortia formed, they aim to examine the Blockchain technology more closely, to identify the financial, legal and operational obstacles in front of the technology and to develop suggestions. In addition, these consortia can offer various solutions to companies that would experience Blockchain technology and decentralized applications without having to incur large-scale costs.

In this context, the following important finding has been designed in the light of the 48 articles systematically reviewed:

- Blockchain technology has many potential utility areas due to its features such as non-requirement of a central

authority by its nature, security, confidentiality, transparency, record system that cannot be changed or deleted.

- Blockchain technology can be utilized to create Business Model Canvas, a strategic management template for creating new business models and documenting existing ones.
- Blockchain technology provides cost advantage by reducing intermediaries with smart contracts and eliminating physical documentsin foreign trade transactions.
- Block chain technology reduces the workload, increases the traceability and visibility of the orders.
- Blockchain technology increases access to the concepts of "self-sovereignty, trust networks, verified claims".
- Blockchain technology reduces "insider attack and intrusion detection".
- Smart contracts provided by blockchain technology to international trade activities promise trade without paper load.
- Blockchain technology does not progress only on the axis of crypto money.
- The sustainability and innovation-oriented focus of blockchain technology creates solutions for "business problems".
- Blockchain technology provides "interoperability" through Internet of Things (IoT).
- Blockchain technology provides "supply chain integration and collaboration" perspective in business management.
- Blockchain technology reduces errors in digital finance transactions. (error reduction).
- Blockchain technology has "data quality and technology competence" in terms of strategic performance.

3. Conclusion

To sum up the progress line of blockchain technology does not follow only the path of crypto-currencies. Today, both academic studies and the research conducted in business circles increased their momentum in the field Blockchain technology much faster than previous periods. This suggests that the adoption of Blockchain technology in different fields and sectors will accelerate in following years. Despite this intensive interest, the actual implementation of Blockchain technology has not reached the predicted levels yet. One of the essential reasons underlying this situation are the obstacles and uncertainties against Blockchain technology in global markets. The lack of globally accepted standards regarding the application areas of blockchain technology could be taken as an important obstacle to the implementation of the technology.

Since it was first popularized by Bitcoin, blockchain technology has developed into a multipurpose tool with applications across numerous industries. Blockchain technology effectively manages the data flow to ensure the security and immutability of data, to share large amounts of data from different parties, and provide time and cost advantages in data acquisition. Blockchain technology have helped to find important application areas in the field of product traceability, data management, and control, payments and contracts in the supply chain.We conducted a systematic review in which we generated a map of all pertinent research using the systematic mapping study process in order to comprehend the state-of-the-art of use of blockchain technology in the business and management industry. The study's specific goals were to clarify the dominant theoretical lenses foundational blockchain technology, identify the structure of blockchain technology in the business and management literature, and assess the findings of research articles related to blockchain technology in order to inform future studies. We examined 48 publications that were the result of our search and paper selection methodology in order to answer the research questions. The findings show that the studies on the subject have increased after 2018, there are studies on the subject in many countries of the world, especially in Germany and the USA, and blockchain technology is intensively discussed in the innovation management, supply chain management, financial management, resource management, identity management. As a result of the examination, it can be said that applied studies dealing with the relationship between business management and blockchain will increase in the coming years. However, concerns about this technology still exist.At the beginning of these concerns are possible attacks on databases as a result of the fact that blockchain technology causes a devastating change to the existing system and the complete digitization of transactions. It is foreseen that the issue of security is important and will be the focus of future studies.

According to our study, there are various business cases for blockchain technology, including the innovation managemenet, supply chain management, financial management, business strategies, sustainability, resource management, identity management, strategic performance management, human resource management, business, and others. The use of blockchain technology in business and management is still in its early stages, thus researchers need to develop more proofs-of-concept and prototypes based on new blockchain paradigms. Researchers will gain a deeper understanding of the technology and its state of development through this investigation. To further comprehend, characterize, and assess the applicability of blockchain technology in the business and management sphere, more research is still required.

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