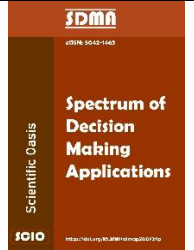




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# Blockchain Technology from The Supply Chain Perspective: A Systematic Literature Review

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### ABSTRACT

Blockchain technology has emerged as a transformative force in supply chain management, offering significant advantages such as enhanced transparency, traceability, trust, and immutability. These features address critical challenges in modern supply chains, including inefficiencies, fraud, and lack of trust among stakeholders. Despite its potential, the integration of blockchain technology into supply chains remains underexplored in both academic and industrial contexts. This systematic literature review aims to bridge this knowledge gap by examining the benefits and challenges of blockchain technology in supply chain applications. The findings highlight key advantages such as improved traceability, transparency, and cost efficiency, while also identifying challenges like high implementation costs, data privacy concerns, and technological immaturity. The review concludes that blockchain technology holds significant promise for revolutionizing supply chain management, but further research and practical applications are needed to fully realize its potential. This study provides a comprehensive foundation for future research and offers valuable insights for practitioners considering blockchain adoption in their supply chain operations.

## 1. Introduction

Today, the entry of major developments in technology into the industry has led to the emergence of the industry 4.0 approach, which is known as the full automation of business processes [1]. While most manufacturers produce everything from raw materials to final products in the traditional business processes, the number of intermediaries between the producer and the end consumer has increased in modern business processes [2]. With the pressure of prices and global competition, manufacturers turned to core competency areas such as engineering and thus, it started to outsource almost all production processes [3].

However, the use of external resources and globalization have caused fundamental changes in production. Processes such as coordination of information, optimization of production and logistics

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have become more difficult, leading to increased complexity of the supply chain (SC). Modern SCs, getting more complex, include a large number of stakeholder organizations, each with specific roles [4] and most of the stakeholders do not have enough information about the process. This situation causes problems in low transparency, security, traceability, and authentication [5]. These problems can be solved by advances in information technology, such as the companies in the procurement process collecting, sharing and processing their own data.

In a world where the quality perception of consumers in different sectors is increasing and the markets are globalized, companies need to handle the modern SC system, which is a complex system, and ensure its full traceability [6,7]. This requirement results in quality information exchange between all actors of SC to meet the increasing demand of the consumer regarding sustainability, safety and quality [6]. Blockchain (BC) is one of the promising technologies to exchange information transparently.

BC, a decentralized process and data management technology, was first introduced as a basic technology to support bitcoin implementation by Satoshi Nakamoto, who is not known to represent a person or group [8,9]. In fact, BC was not the first attempt to use secure chains of block to encrypt and track data. Stuart News and W. Scott Stornetta described the first studies of encrypted chains of block in 1991 [10]. Bitcoin and BC have allowed mutually mistrusting entities to make financial payments without relying on a central trusted third party while offering transparent and integrity-protected data storage [11]. Standing out beyond financial transactions due to the mentioned advantage, the BC holds promise in digitizing SC flows and supporting transparent collaboration [12].

SC consists of many stakeholders located in different geographical regions. As this situation creates difficulties in monitoring and research, customers lose interest due to problems such as delayed delivery, not expected quality of the product, damaged or broken product, expensive and slow delivery. It is necessary to ensure transparency and reliability to increase the customers' lost interest and to cope with the problems of not being able to verify the product and service [13]. This understanding is possible with technological innovation BC [14], which promises to make the current system in industries smart and sustainable [15].

Although BC has attracted attention over the last few years [16-18], it is still in the development stage [19], so there is not enough information in the literature about the contributions it will bring to supply chain management (SCM) and the difficulties in its implementation [20]. In addition, as most people are skeptical of the high cost and contribution of BC applications [21], a systematic review of existing research is extremely important for both academics and administrators to develop a solid foundation, deep understanding and help accelerate the adoption process. This paper, which tries to close this knowledge gap in the literature, reports a systematic literature review by examining the articles related to the BCT studies, which provide new opportunities in SC, and contribute to the academy and businesses.

Studies on BC have gained momentum in recent years, but more work should be done to facilitate managers' adoption of this topic [22], to better understand new events, emerging gains, and potential problems [23]. Such studies will help practitioners and academics better understand the problems and challenges involved in technology adoption and develop strategies to overcome them. Since there is limited literature on this topic [24], research has been conducted on how BC features affect SC with a conceptual approach to answer the questions in mind. The aim of this article is to examine the obstacles that BCT will face in SC applications, the advantages it will bring, and to define perspectives to direct future research. The remainder of this article is summarized as follows: In section 2, basic investigation principles are presented, and data analysis has been done. In section 3, key features of the SC and BC are described to conduct a systematic literature review. In section 4

highlights the advantages that the BC will bring to the SC and the challenges that this combination will face. Finally, the study is summarized, and final comments are expressed.

## 2. Data analysis

To achieve the aim of the study, a systematic literature review was carried out by examining the studies conducted until August 2020. In this study, synonyms were separated using the combination "OR" and different words such as title, summary, "blockchain", and "block-chain" in keywords were searched in the Scopus database. In accordance with the research strategy, the database was limited to English studies and 931 articles were obtained (Figure 1).

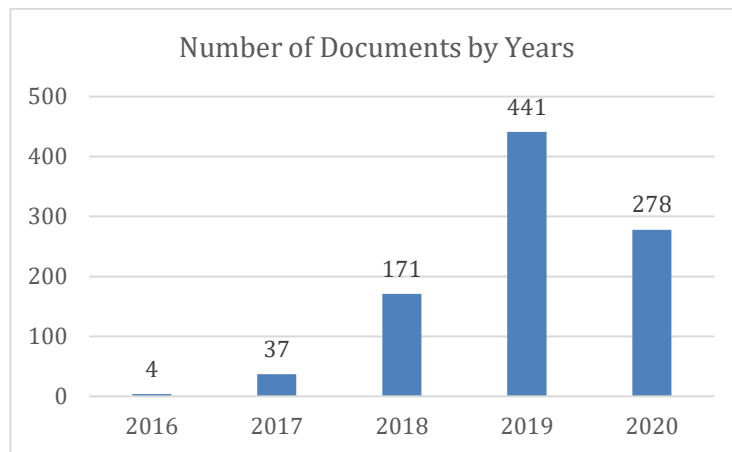


Fig. 1. Number of documents by year

From the years 2016 to 2019, the number of academic publications dealing with increased exponentially. The number of publications for August 2020, when this research was conducted, was 278. Refer to Figure 2 for an overview of the classification of publications according to their original sources.

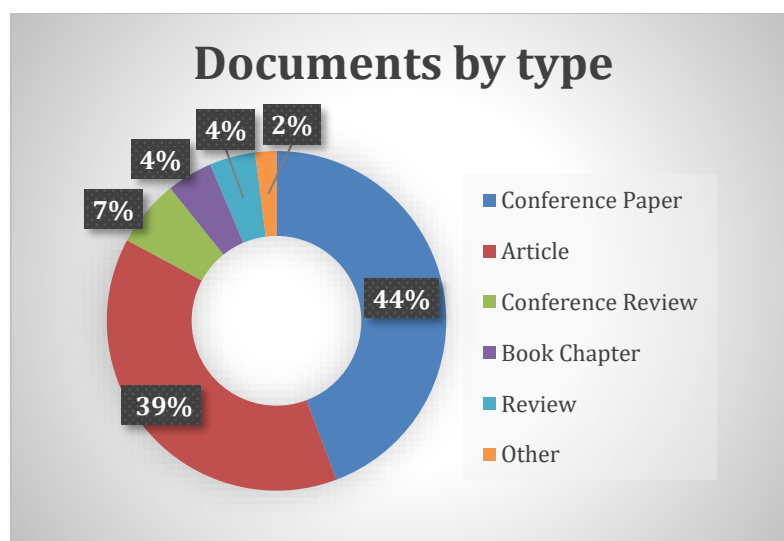
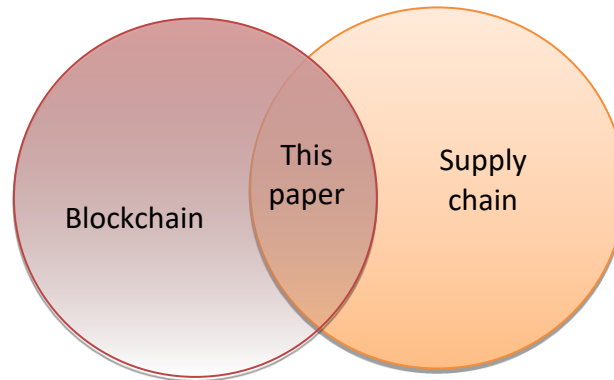


Fig. 2. Document rates according to publication type

Since some publications contain a few of the keywords related to BC, duplicate studies were omitted in the second step. In the screening phase, studies were scanned as abstract and title to remove publications that are not related to the subject. The main texts of the articles deemed necessary were also examined closely. Articles that clearly state the aspects of BC that support SC philosophy or practices have been reviewed further. Using these criteria, the number of articles was reduced to 120. Figure 3 illustrates the intersection of blockchain and supply chain research, highlighting the scope of this paper within both fields.



**Fig. 3.** Study subject of the paper

### **3. Supply chains and blockchains: Basic concepts**

#### *3.1 Supply chain*

Supply chain is the process consisting of resources, activities, individuals and organizations involved in the life cycle of the product, from the production of the product to its delivery to the end user through distribution [1].

In traditional SCs, a single company has significant control over business activities [21]. Central systems are prone to collapse, as traditional systems do not guarantee the integrity, quality, and transparency required to maintain information [25], as well as a single point of failure can cause the entire system to fail [19]. Nowadays, all supply chain partners are synchronized by using integrated business processes and information between organizations with the help of modern supply chain methods to overcome these problems [21].

Apart from the advantages of modern SCs, they have some problems such as inefficient transactions, theft, fraud and poor performance, and lack of trust. They are also difficult to manage and control, as they involve geographically diverse partners. BC, a distributed ledger technology that provides transparency, traceability, and security, hopes to promise to alleviate some of the global SCM problems [26,27] The system has the potential to operate in a transparent and reliable manner, as SC member organizations using blockchain technology cannot manipulate the information in the chain. Transparency, traceability and security are increasingly becoming a fundamental differentiation and an urgent requirement in many SC industries [28] such as food [29], agriculture [30,31], furniture industry [32], luxury consumer goods [33], pharmaceuticals and medical products [34]. Blockchains are very attractive for use with global financial systems, thanks to their robust and decentralized functionality, can be easily extended to contracts or operations such as tracking global SC [35].

#### *3.2 Blockchain*

Considered as one of the leading and groundbreaking technologies, BC [36] is a record list that can resolve transactions in a short time using computer algorithms that update itself in real time and

do not require third-party verification [37]. BC can also be defined as an immutable ledger that records transactions held within a distributed network [38]. As each transaction occurs, it is placed in the block and each block is linked to a block before and after a block [37]. As blocks are added, the system develops and these blocks form a chain [39,40].

All data in BC is available to all users on the network, and any user on the network can check or copy this data at any time [41] but cannot modify or delete it [42]. In other words, BC is an immutable gateway that can be shared among all nodes in the system [43]. However, they can be verified and managed using automation and sharing protocols [42].

There are two types of access BC based on the regulation of those who can read the BC, send transactions and participate in the consensus process. The distinction between public and private blockchains is about who is allowed to join the network and who is allowed to execute the consensus protocol.

- i. **Public Blockchains:** It is an unauthorized system where all users have the right to join and leave the network whenever they want and have the right to write and read [6]. Any transaction of this type can be viewed by anyone (unauthorized access) and all participants can generate transactions [42]. Information on transactions is available to network participants in a public environment [44]. In other words, it is an open distributed ledger where any node can join the network and perform transactions without any authentication, such as Bitcoin [2]. The disadvantage of a public blockchain is that significant amounts of computing power are required to maintain a large-scale ledger [45], as any internet user can access information about transactions [46].
- ii. **Private Blockchains:** It is a permitted distributed ledger where users and their rights are kept under control by an organization [2,6]. A limited number of users who have permission to participate are authorized to use the ledgers [46]. This type of BC is limited to the access of participants in a single organization to transaction information [44]. Access is controlled by a consortium of members (consortium blockchains) or a single organization (private blockchains) [42]. The access control mechanism may change, for example: the network administrator can decide on current participants and future participants based on some rules, or a regulatory authority can give consent for participation [45].

Table 1 provides a comparison between public and permissioned blockchains, highlighting key differences such as participation, permissions, speed, and transparency.

**Table 1**  
 Comparison between blockchain types [47]

Description	Public	Permissioned
Participation	Anyone	Members of organization
Write permissions	Granted	Restricted
Read permissions	Granted	Granted
Speed	Slow	Fast
Identity	Anonymous	Anonymous
Security	Impervious to security attacks	Impervious to security attacks
Transparency	Visible across all supply chain nodes	Visible across all supply chain nodes
Traceability	Yes	Yes

### *3.3 Blockchain applications for supply chain*

Although blockchain technology (BCT) is not currently widely used in non-cryptocurrency applications [47], it has the potential to change existing applications and traditional industries [48,49]. Technologies associated with Industry 4.0, such as radio frequency identification (RFID) [50], smart contract [51], internet of things [52], have caused significant disruptions in traditional SCM and forced this area to develop new business strategies [53,54]. Potential applications of BC in SCM are seen in the planning phase [55], product traceability [56], management of risks and failures [57], and coordination phase [58], trust building [59] advanced order [60], inventory management [61,62].

#### *3.4 Radio Frequency Identification (RFID)*

RFID (Radio Frequency Identification) is a non-contact automatic identification communication technology that can identify objects moving in a difficult environment and at high speed without manual intervention. With the integration of RFID technology and BC-based data management system, full visibility between different members of SC can be real [63]. It can also label, save and manage the information of objects [64] by creating globally valid tags such as RFID to identify the link between physical products and their digital display [65].

RFID technology is a useful technology with good technical performance and high efficiency that improves the SCM level [66] by providing the collection of unmanipulated process data [67] to prove the authenticity of products and to monitor that the transfer is done correctly [68]. RFID technology has the advantages of being more environmentally friendly, easy to use and recyclable, thanks to more waste reduction compared to barcodes [64]. However, RFID technology is costly compared to the barcode, as it requires sensors attached to the product to track product routes [25] as items move along the detection gates. Barcode can be used as an alternative in processes when accuracy standards are not required, and data types are not many [69]. However, RFID should be used to obtain information about the physical and chemical properties of the product or environmental properties such as temperature, vibration, humidity [63].

#### *3.5 Smart contract*

Contracts, established between stakeholders, are one of the main parts of SC. However, traditional contracts are not suitable for BC technology because of their slow processing, leading to the emergence of smart contracts that are one of the groundbreaking solutions that have recently been introduced. Smart contracts are digital agreements between companies operating in SC process (e.g. carriers and retailers) and are self-executed by a software. Moreover, the software automatically runs the conditions of each production or distribution stage when the stage is completed (for example, when the production of a component is completed, its cost is automatically paid) [7]. In SCs guided by traditional contracts, a time lag occurs between product delivery, invoice creation and final payment [21]. On the contrary, smart contracts will not only define the rules and penalties around a contract like traditional contracts but also automatically enforce obligations, reducing or ending the time lags between delivery and payment [40]. In addition, its enhanced transparency improves the contractual asset transfer process, as all network participants can observe the common database. The spread of BC technology has increased interest in smart contracts [41]. Smart contracts aim to verify and execute contractual obligations to deal with problems such as misunderstanding, fraud and performance failures [53]. As a result of above-mentioned advantages of smart contracts, they add trust building, transparency, traceability, auditability and efficiency to SC [70].

Smart contracts that enable the implementation and execution of agreements [71] eliminate the need for reliable intermediaries [2]. So, a smart contract allows SC members to trade without

brokerage firms. Working in a decentralized way, BC provides an infrastructure for independent execution and verification of smart contracts [72].

Six types of smart contracts embedded in three SC processes are applied to identify deviations from planned operations in the framework proposed by Chang *et al.*, [17]:

- i. Supplier, logistics, and buyer contracts in the transaction process
- ii. Payment contracts in the payment process
- iii. Query forwarder and query dispatcher contracts from external databases in the data accessing process.

Figure 4 illustrates the smart contract framework, showing how different contract types interact within the supply chain to enhance efficiency and automation.

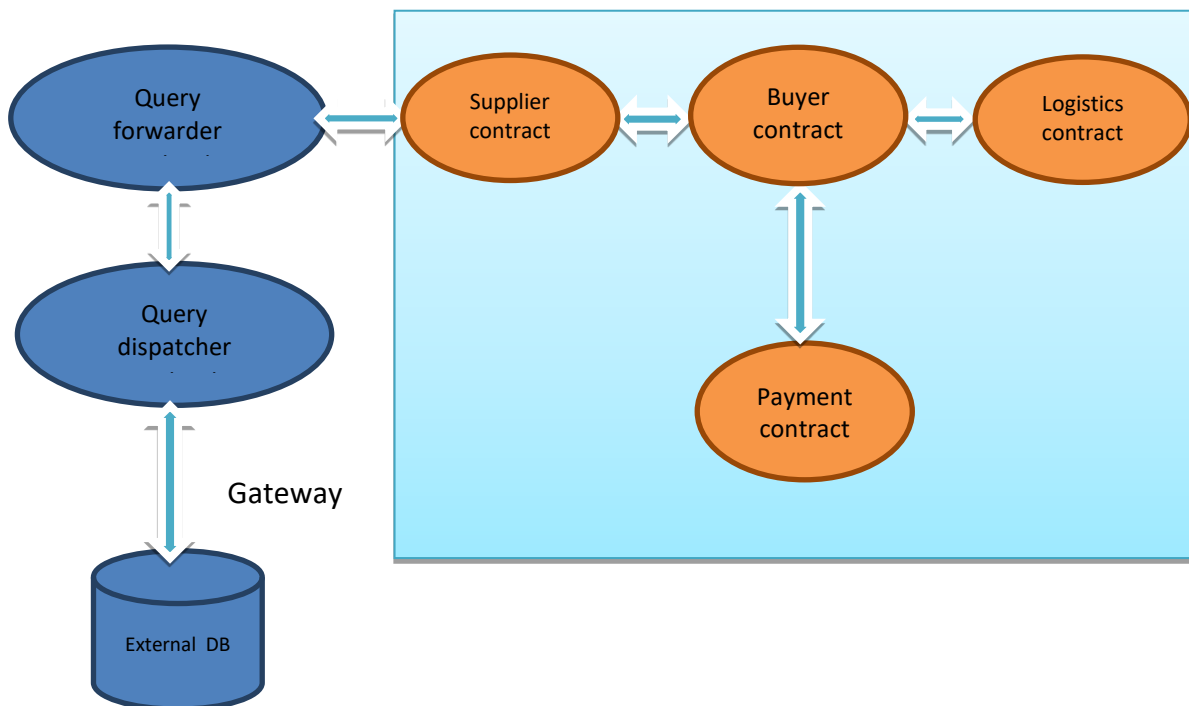


Fig. 4. Contract framework [71]

### 3.6 Internet of things (IoT)

Another application in the integration of BC to SC is Internet of Things (IoT) technology. IoT is the communication of smart devices [73] by collecting real-time data especially in 5G enabled environments [1]. Throughout the SC, objects are increasingly equipped with sensors that generate data. While smart contracts bring various quality, asset, logistics and transaction information to the system, they collect this data from the real world via IoT [69]. To increase the transparency and efficiency of SC, IoT and BC are one of the most promising applications for the constant storage of these data [5]. However, since IoT generates large amounts of data for transparency and efficiency, the costs of setting up and managing the system are high [68].

Integration of BCT with the IoT has great potential to improve the performance of SC and increase its efficiency [63]. For example, with this integration, contractual fraud can be easily detected and prevented [40]. Thanks to its secure data sharing infrastructure, it can solve data security problems [5]. This integration allows dynamic use of SC by virtualizing the operational management process, making it easier to deal with unforeseen delays and sustainability issues [74]. It can also be used in

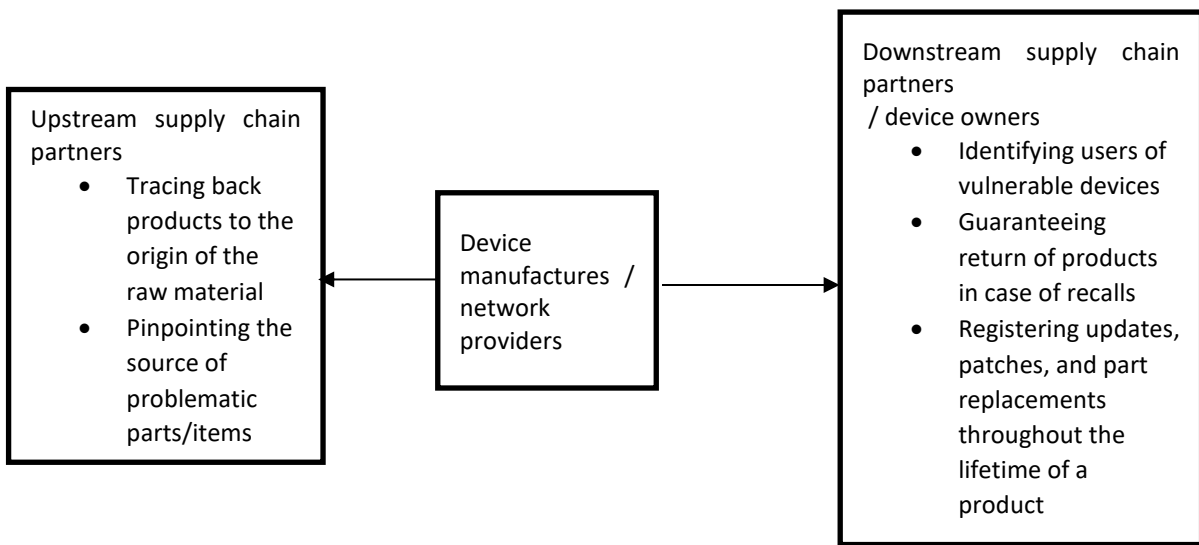
the exchange of transaction data between two or more SC actors and in the automation of activities that require a trust broker without the need for a third party such as a lawyer, notary or banker.

### 3.7 Utilization possibilities and challenges of combining blockchain into the supply chain

Although the benefits of BCT have been researched extensively in the financial sector [75], there is not enough research on the benefits it will provide to SC. Application of BC to SC can provide benefits such as timely delivery of orders, dealing with error-free, undamaged products and large-scale data [76].

BC can be an effective tool for monitoring sources of insecurity, increasing the security of both upstream and downstream links in SC. Once a security breach is detected, this technology makes it easy to discover the breach. Thus, BC can facilitate dealing with crisis situations such as misinformation flow and recalls of faulty products [77]. Figure 5 illustrates how BC contributes to strengthening security measures in the supply chain by ensuring traceability in upstream processes and enhancing cybersecurity for downstream partners.

There are still some challenges to integrate BC and SC technologies, such as account cost, security, and transaction delay [78]. Since BC algorithms require high computing power, they consume much energy [79] and thus incurring a high computation cost [80]. Moreover, it may be costly to build and maintain a BC network but the cloud infrastructure costs for hosting BC nodes can be optimized [81]. In addition, with Blockchain technologies, it takes time to reach consensus and confirm transactions; this could be a problem in integrating BC's with real-time applications [82]. Interaction between stakeholders in the chain and unknown outside of the chain could potentially raise privacy and security concerns at both ends [83].



**Fig. 5.** BC's role in enhancing overall security in supply chain networks. By reaching immutable records with BC, it is possible to understand the important vulnerabilities in the upstream supply chain. This technology can also help strengthen defensive cybersecurity measures for downstream supply chain partners and device owners [84].

Table 2 presents a comprehensive comparison of the advantages and challenges associated with integrating BC into SC.

**Table 2**  
 Advantages and challenges of integrating the BC into the SC

Advantages	Descriptions
Traceability	<p>BC provides suitable solutions for quality tracking and traceability.</p> <ol style="list-style-type: none"> <li>i. BC ensures product and service flow monitoring. It effectively solves the problem of protection against counterfeiting. [22].</li> <li>ii. BC enables consumers to obtain transaction information of the products purchased and to track the origin of the products [85].</li> <li>iii. Relying on a third party creates a weak spot in the system. BC is a way to ensure transparency and strengthen traceability as it eliminates intermediaries such as banks and notaries [86].</li> <li>iv. The traceability of SC allows stakeholders, authorities, government agencies and consumers to be sensitive to risks and respond to them [87].</li> <li>v. BC enables consumers to know the facts about the origin and production methods of the product [88].</li> <li>vi. By integrating smart technologies such as the IoT into BCs, digital footprints of products can be created permanent, shared and applicable records throughout SC. Such visibility enables product traceability and tracking of authenticity [42].</li> </ol>
Time	<p>BC promises significant improvements in SC's performance and operational efficiency.</p> <ol style="list-style-type: none"> <li>i. Thanks to the real-time information exchange, it prevents the waste of time caused by the whip effect [89].</li> <li>ii. Laws and regulations are coded in BC and applied automatically. Thus, it saves time [3].</li> <li>iii. BC reduces mistakes in the process and provides exemption from physical controls. This shortens the delivery time [71].</li> </ol>
Transparency	<p>Each participant in the BC network can have access to all previous transactions.</p> <ol style="list-style-type: none"> <li>i. Because all records are verifiable, the blockchain eliminates the need for third-party verification and provides greater transparency in the supply chain [90].</li> <li>ii. BC increases efficiency and transparency, as it is a decentralized distributed ledger accessible to all participants and stakeholders [91].</li> <li>iii. BC increases visibility in the SC as it reveals transaction data [92].</li> <li>iv. BC increases transparency to enable people to have better quality products / services and to increase their power in purchasing determination [93].</li> </ol>
Confidence	<p>BC can execute transactions without trust between users.</p> <ol style="list-style-type: none"> <li>i. Emerging technology solves the problem of decentralization, enables digitalization and eliminates the need for intermediaries [94].</li> <li>ii. BC performs transactions without personal trust between parties, thanks to technologies such as smart contracts [95].</li> <li>iii. BC eliminates the central trust authority as it ensures the security of the information added to the chains between the nodes through the mining process. [96].</li> </ol>
Constant	<p>BC cannot be intervened with operations such as deletion or change.</p> <ol style="list-style-type: none"> <li>i. Once transactions are verified, they cannot be changed [60].</li> <li>ii. The immutability and ir retrievable of the data acts as an independent source of truth between the SC parties [97].</li> </ol>
Cost	<p>BC can reduce the cost of SC.</p> <ol style="list-style-type: none"> <li>i. By increasing the efficiency and transparency of BC SC, it reduces costs arising from disagreement between members of the SC [98].</li> <li>ii. BCT eliminates brokers and auditors, provides lower costs and higher efficiency [99].</li> <li>iii. Through the integration of the BC into the SC, the number of items kept in inventory decreases, old products and inventory costs decrease [100].</li> <li>iv. Data transparency and agile decision making based on BCT help companies to partner with and develop more SC members. This increases the variety of products and services while reducing costs [23].</li> </ol>
Paperwork reduction	<p>BC allows transactions to proceed without the need to exchange documents.</p> <ol style="list-style-type: none"> <li>i. BC reduces the communication and paper processing costs by transforming the trade into paperless. This reduces errors and provides lower inventory [101].</li> </ol>

Advantages	Descriptions
	<ul style="list-style-type: none"> <li>ii. BCT transforms the global SC platform by eliminating the physical verification of documents [102].</li> <li>iii. BC eliminates paperwork such as commercial invoices, origin certificates, audit certificates, insurance certificates, and prevents delays [103].</li> <li>iv. Smart contracts embedded in BC save paperwork, speed up processing time and minimize human effort compared to traditional SC [104].</li> </ul>
Authenticity assurance	<p>BC guarantees a product to be of the expected quality and authenticity.</p> <ul style="list-style-type: none"> <li>i. With BC-based designed digital fingerprints, it presents the details of each product in a well-defined way [33].</li> <li>ii. Thanks to its RFID technology, BC enables the tracking of every step of the product in the SC process, ensuring its authenticity. [79].</li> <li>iii. BC guarantees the originality, origin and freshness of materials / products purchased by consumers [105].</li> </ul>
Permanent	<p>BC always keeps the entire transaction history.</p> <ul style="list-style-type: none"> <li>i. Data is stored in BC forever, as it prevents malicious participants from manipulating data [2].</li> <li>ii. If the transactions in the newly added block are real, they are permanently stored in the general ledger [106].</li> <li>iii. All information about SC is kept in BC without any interruption. [107].</li> </ul>
Improved information flow	<p>BC allows tracking of physical assets.</p> <ul style="list-style-type: none"> <li>i. Sensors and various smart devices are used in IoT integrated BCs that can monitor useful information such as the location and quantity of parts in full time. This development in the system allows for a planned production schedule in the production facility and to improve the tracking systems of the goods [108].</li> </ul>
Environment	<p>Green SC applications can benefit from BCT.</p> <ul style="list-style-type: none"> <li>i. To optimally manage the environmental performance created by a large number of stakeholders in a SC, the process can be monitored in an integrated manner thanks to BC and thus, the decision-making process based on cooperation is carried out [109].</li> <li>ii. BC provides high efficiency and low pollution levels by addressing issues such as waste management, energy management and carbon footprints [110].</li> </ul>

Difficulties	Descriptions
Privacy	<p>BC requires each participant to share information about transactions, even in special configurations.</p> <ul style="list-style-type: none"> <li>i. Users doubt the security of the system against cyberattacks [111].</li> <li>ii. Since every transaction is posted in a common ledger, users can be identified by their public key. While this perspective can help provide transparency and trust, it cannot protect users' privacy [31].</li> </ul>
Data Quality and Sharing	<p>The success of BC depends on data quality and the willingness of stakeholders to share data.</p> <ul style="list-style-type: none"> <li>i. The data kept in a central database, or the inconsistency of the data entered affects the success of BC [112].</li> <li>ii. Poor data quality will result in a decrease in decentralized SC profit [113].</li> <li>iii. Although businesses report some information, they are reluctant to share sensitive information in a competitive environment [114].</li> <li>iv. Firms are concerned that they will put trade secrets, intellectual property and SC details at risk, as it will increase interactions with other participants, including competing organizations [47].</li> </ul>
Uncertainty	<p>Since BC is not yet mature, its technological uncertainty is high.</p> <ul style="list-style-type: none"> <li>i. Technological uncertainty, scalability issues, and development costs in BC pose major challenges. [24].</li> <li>ii. The reason for BC adoption in the SC is its uncertainty regarding various organizational, technological, operational and social barriers [115].</li> </ul>
Adoption	<p>More applications need to be developed to better understand the strengths and weaknesses of the BC.</p> <ul style="list-style-type: none"> <li>i. As we are in the first phase of BC, technology adoption and spreading is a general concern. [116].</li> </ul>

Difficulties	Descriptions
Lack of information	ii. BC has not proven its worth in any industry other than finance, which makes people skeptical [117].
	iii. Adoption depends on the financial investment decisions of senior managers. Managers want to see a sample business case that shows expected returns [48].
	Because the issue is still at an early stage, deeper knowledge is needed to identify opportunities and challenges.
Connection issues	i. Although blockchain has high potential, supply chain professionals are not familiar with this technology [118].
	ii. Because it is in the early stage of development (immature), industry leaders are not aware that it may provide a competitive advantage [119].
	iii. Despite this good image of BCT, many companies are still skeptical that BC will bring profits to it and its viability. The need to explain this technology is increasing, as the lack of knowledge and misunderstanding of the technology can be an obstacle to successful applications [40].
Connection issues	There are synchronization problems caused by the immaturity of technology.
	i. BC is one of the most promising technologies in the supply chain thanks to its features such as data integrity and decentralized operations. But how BC will be included in SCM and when and how this situation may be are still questions that need to be answered [19].
	ii. BC from different providers and services are difficult to connect properly and smoothly [120].

#### 4. Results and conclusions

In this article, it is aimed at contributing to industry applications and academic research by presenting a conceptual study on the supply chain applications of blockchain. This study provides research and review of the benefits and challenges of applying blockchain technology to the supply chain, and in this context provides the basis for further research. However, this research, which is a conceptual guide based on review, has some limitations. While some features of the blockchain implementation are thought to be helpful in supply chain management, there is still little use to support this idea. The subject should be further tested and empirically verified. The literature review has also shown that there is still a research gap in the subject. Due to the lack of research on this topic, it is difficult for industrial stakeholders to fully understand how to use blockchain technology in their business.

From a supply chain perspective, blockchain is a regulatory technology that covers multiple organizations and processes, helping to manage the supply chain, as well as making it transparent, reliable and efficient. Blockchain technology can eliminate its problems by making the supply chain more efficient and reliable. Technology may not have found sufficient application areas, but as information and needs arise, more use cases of blockchain technology will occur.

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#### Conflicts of Interest

The author declares no conflicts of interest.

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