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Review Article

Systematic Analysis of Risk Associated with Supply Chain Operations Using Blockchain Technology

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Advancements in information and communication technologies (ICT), big data analytics, and artificial intelligence- (AI-) based techniques brought a dramatic revolution in diverse research domains, including healthcare, IoT, and networking. Blockchain technologies are gaining traction from both private and government organizations at an incredible rate. Emerging technologies have different levels of technological complexities and commercial ramifications. This technology is playing an essential role in the financial revolution of banking and regulatory sectors. Blockchain has piqued the interest of many academics, organizations, and businesses, particularly in using bitcoin. To grasp the significance of this revolution, a comprehensive assessment is performed to bridge the gaps in the targeted blockchain-driven domain with different perspectives. For this systematic review process, a set of four distinct research questions were formulated to accumulate the most relevant research trends. In private and public organizations, it is a securing technology to deliver trustworthy and protected services to users because of its decentralized, controlled aspect. Financial services, real estate, supply chain management, healthcare, academics, and other industries benefit significantly from this evolutionary technology. These application cases are diverse and far-reaching, ranging from smart contracts to blockchain-encrypted educational certificates. This systematic analysis has investigated a total of 113 relevant articles and concluded with the features and functions in an economic setting and briefed how these variables can balance players' incentives, define core blockchain-related features, and present new research ideas to solve the proposed risk.

1. Introduction

Technology has changed administration departments in the organizations to observe the positive influences of the technology [1]. Recently, our civilization has witnessed introducing an inventive trend of disruptive technologies across several industries dubbed Industry 4.0 [2]. The Internet of Things (IoT) [3] and its emerging concepts are increasingly coming together to achieve a common goal: enabling intelligent objects to interconnect nearby and over the Internet to gather comprehensive data that provide modified automation services with minimum deliberate human interlinkage [4]. IoT has multiplied due to the continual advancement and development of sensor technology, wireless network data transfer, embedded technology, and computer control technology. The IoT is deliberated the 3rd world information industry wave after computers and the Internet, quickly expanding [5]. The IoT intends to ease the collecting of dispersed data in the worldwide manufacturing industry [6] and the sharing and processing of knowledge and information thru many cooperating associates through the use of suitable information system design [10].

In this modern technological age, the Internet of Things- (IoT-) based application and blockchain technology-based smart systems can process data to retrieve information by ensuring high privacy and data security. It is building a global information network made of many interlinked "Things," which is a vital enhancing technology for contemporary manufacturing [7]. Data is the key to quickly gauging educational performance. However, data and education are

locked and segregated among centralized systems, resulting in knowledge gaps and errors [8]. With constant improvements in computation studies, ranging from high-speed calculations to smart autonomous systems, there has been a significant influence on other related subjects such as aerospace engineering, biomedical engineering, and robotics. As a contemporary trend and key multidisciplinary topic in the scientific world, robotics has embraced different technical assets from multiple fields [9]. Collaboration between companies is vital for achieving larger, shared goals. Consider a supply chain, where the cooperation of several firms results in a product via the various processes from manufacture to distribution [10].

Blockchain technology has just expanded much attention from industry and academics [11]. It is being employed in cryptocurrencies or electronic cash and other areas such as healthcare, financial transactions, manufacturing, insurance [12], education, and IoT, with the capacity of increased skills and durability [13]. Due to high security and credibility, it has changed the way accounts are kept in recent years. Its implementation has been spread to various other industries, such as financial sectors, banking, intellectual property protection, securities, and electronic currency [14]. Blockchain has several valuable qualities, including the ability to reduce trust assumptions. It is a technology that improves transparency by allowing users to get data and verify its integrity locally [15]. Bitcoin [16] and other cryptocurrencies are enabled by blockchain technology, which is a secure decentralized computer ledger [17].

Blockchain is a decentralized ledger for securely storing peer-to-peer network data transactions. Further, it ensures that transactions are verifiable and transparent. The primary goal of blockchain technology is to enable dual parties to perform secure transactions without the interference of a moderator [18]. Data is public and cannot be redacted in the classic blockchain system. With the advancement of blockchain technology, the problem of data immutability will become more important once it has been written on the chain [19]. Recently, the blockchain technology has fascinated well-known attention due to its valuable features, e.g., transparency [20, 21], traceability [20], decentralization [22], and immutability [23]. A blockchain contains data in blocks, which create a linked list in the order determined by a distributed consensus process [24]. Blockchain technologies are still in their early phases, and recent advancements in blockchain technology may influence findings. The created tool might provide decision-makers with a basic picture of the advantages of using blockchain technology before deciding whether or not to integrate it into their existing system [2].

The blockchain architecture facilitates information collection, management, preservation, storage, and delivery. As a result, it may be used in various industries, including health record management, digital voting, IoT data, academia, and research publishing [25]. The blockchain is a new technology that accesses many people to agree on a shared state without trusted middlemen [26]. Blockchain has recently piqued the interest of many industries and academics. By making a trustworthy and secure solution, the participants in the network share the same ledger in a distributed setting with no centralized authority. Traditional blockchain protocols have a relatively poor throughput, and researchers have proposed many strategies to increase it. Bitcoin is the first blockchain system that organizes blocks in a linear chain. Bitcoin miners will do their best to solve random cryptographic problems, a process is known as proof-of-work, to keep the chain alive. In conjunction with blockchain technology that processes network data, high privacy, and security issues, data regulations may be applied to software artefacts and data, as with the IoT [27].

2. Background Study

The economy is essential in building a resilient community, and publicly traded enterprises play a crucial role in the native economy. The challenge posed by global environmental developments has converted a severe impediment to long-term humanoid progress, and long-term process development has grown considerably more complex [28]. Corporate governance has been formed to control and direct the company by its shareholders. According to the agency theory, there will always be a mismatch between shareholders' and the organization's management's aims [29]. Corporate governance is explained by the board of directors and audit committee characteristics, and corporate debt is calculated by debt ratios, short-term debt ratios, and long-term debt ratios. The situation of corporate governance has been a significant factor that affects corporate development and even regular economic running [30].

The so-called internal management and control system's internal governance structure comprises three components or methods by the board of directors, the managers, and the shareholders. The management operations of the control system on the external market through competition are referred to as the outer governance structure or external control mechanism such as market manager, capital markets [31], product markets [32], market control, the government management system [33], accounting standards [34], legal, market manager, social media [35]. They give company performance statistics and analyze corporate conduct and operational performance [36]. The state of corporate governance has been a critical factor influencing business development and even routine economic operation [37]. The form of ownership in a corporate is an essential component of appropriate regulation of significant enterprises' activities in the market environment at the micro and macro levels allowing all parties to the relationship to reflect their interests [38].

Artificial intelligence (AI), a subfield of computer science, underpins the theory, technique, technology, and applications for mimicking, extending, and enhancing human intellect [23]. The notion of a smart city relates to improving the city's quality of life by utilizing full use of idle resources via sharing. Because of technical limitations, most modern resource distribution systems use centralized data storage [39]. In 2008, bitcoin was the first suggested cryptocurrency, presenting the blockchain as a distributed infrastructure platform. It enables the transfer of decentralized peer-to-peer Internet currency known as "bitcoins" from

one party to another without needing a banking sectors [40]. In various digital contexts, the big data age is undermining consumer privacy. By analyzing, correlating, collecting, and managing huge volumes of personal data, large third parties gain from managing their users' data. These organizations and their services are vulnerable to security breaches and exploitation of customer data, which influence compromise their operations consumers' privacy, even if they are not aware of it [41].

Blockchain was established in January 2009 as the core technology of bitcoin, combining significant accomplishments in disciplines such as contemporary cryptography and distributed networks. Since the advent of bitcoin, the blockchain network has increasingly handled huge transfer transactions in a distributed way [19]. A blockchain is an advanced data structure comprising a growing list of immutable documents called blocks that are connected using cryptographic algorithms. Each block in a blockchain covers a cryptographic hash of the transactional data, the previous block, and a timestamp. In another way, a blockchain may alternatively be thought of as a distributed data structure or a distributed ledger that operates logically over a network with several nodes connected in a peer-to-peer function [42]. With the fast growth of emerging technologies such as the big data, cloud computing, and Internet of Things (IoT), the underlying technology, blockchain, is becoming the driving force behind research and technology [43]. In the last several years, blockchain has gained a lot of interest. This enormous popularity has prompted several issues, one of which is the scalability of blockchain networks [44].

A blockchain is a precise structure used to store all types of essential data in an unforgeable manner. Blockchain is a new technology that promises to solve unmanageable trust concerns by enabling safe and verified systems in various areas. It is a series of blocks interlinked together as a chain that includes proof of information. This blockchain is first used to timestamp documents to eliminate backdating. The most crucial aspect is that it cannot be modified once the data is captured. Each block is made up of information, a hash, and a hash of the preceding block [45]. After having developed as the technology behind cryptocurrencies, smart contract-enabled blockchains are increasingly implemented in the application of spirited within the organizational information systems [46]. The fundamental technology of bitcoin is blockchain, and its initial purpose is driven from economic incentives. Blockchain is a new technology encompassing several domains, including distributed systems and the Internet of Things (IoT) [47].

Following the Internet as another disruptive technical invention, blockchain has led to developing a distributed accounting system that is tamper-resistant, traceable, highly trustworthy, and decentralized. It can increase the security of grid system data and aid in developing a dependable, effective, and reliable distributed smart grid system [48]. A hybrid of blockchain and IoT seems promising, even though blockchain demands real-time data application and IoT provides mechanisms for safely and efficiently storing and managing information overloads. The technology is vital to the manufacturing industry, undergoing a digital revolution by merging equipment, advances, and data, resulting in the Industrial IoT (IIoT). A combination of IIoT and blockchain is called Blockchain Industrial Internet of Things (BIIoT) [49]. By recording and verifying permitted access to confidential medical records, blockchain can ensure the security of sensitive data. Blockchain is used to protect medical records from manipulation by acting as a distributed database [50].

3. Research Protocol

A systematic literature review (SLR) evaluates and identifies a topic of interest based on specific formulated most relevant research questions. The research questions act as a cornerstone in the SLR process. SLR seeks to provide a balanced assessment of a study topic by employing a rigorous, reliable, and traceable approach [51]. SLR is carried out by many researchers in various fields, e.g., networking [52] and healthcare systems [53]. This research examined and analyzed the most recent studies on the usage of blockchain technology for identification and solving technics of various risk factors. The following are the objectives of this SLR:

(i) To analyze the current research work, four different research questions have been formulated. These questions aim to outline the models and to guarantee high security within the organizations, various kinds of threats that generally faced by the employees in the organizations, various types of tools suggested to help the organizations during unwanted situations to overcome the security risks, and various implications of the blockchain to tackle many research problems within the regulatory organizations

(ii) The aim of SLR is to identify the critical problems within the available solutions and suggest exploited research directions and fulfil the research gaps within the available resolutions. These new research directions will ultimately assist the organizations and employees in ensuring high authenticity for their security means and will have no information leakage and combat intruder's attacks

(iii) This SLR work selected one hundred thirteen most relevant research articles from four different available online libraries. This selection is made on the relevant pertinent research papers that will allow the researchers to identify the most relevant research articles within the blockchain field and assessment details

This SLR work is being carried out in accordance with the established parameters presented by Keele and Kitchenham et al. [54, 55] which is considered in this proposed SLR process. The review procedure for this SLR is shown in Figure 1. It includes eight essential steps: (1) choosing of research domain; (2) formulation research questions; (3) keyword identification and query formulation; (4) digital library selection for article accumulation; (5) filtering the

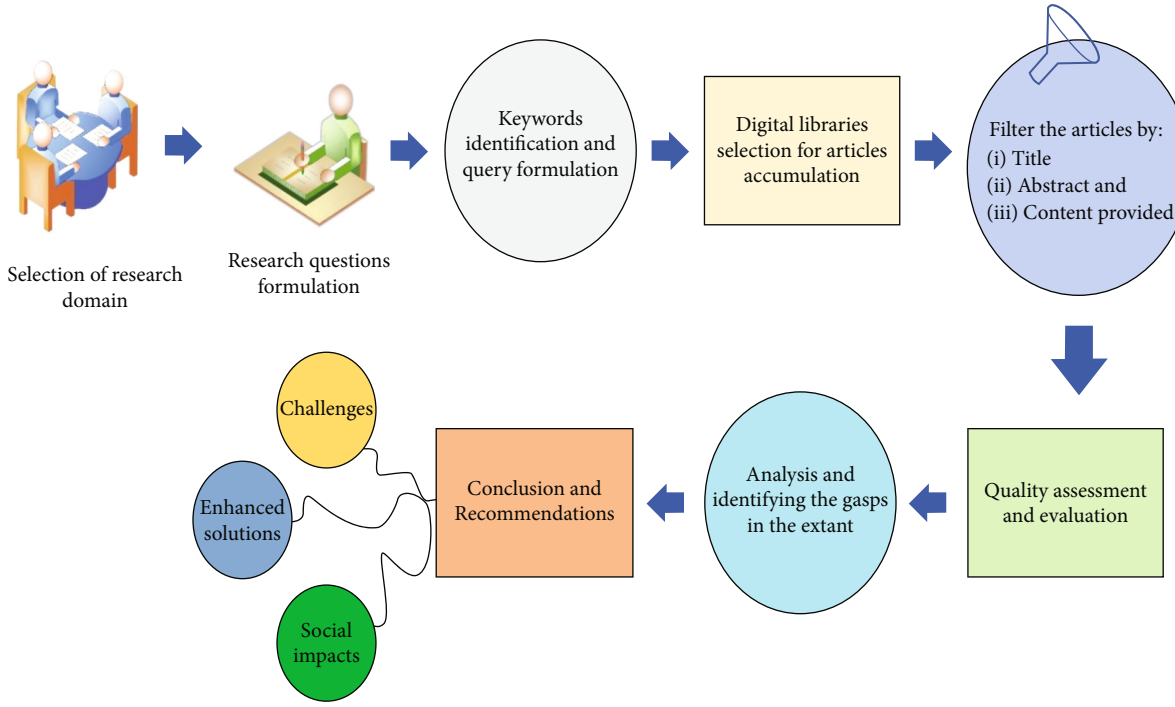

Figure 1: Research methodology for a proposed systemic literature review.

Table 1: Formulations of research questions.

S. no	Research questions	Description
RQ1.	What are the key elements that must be considered for developing a blockchain-based solution for a certain research problem?	Organizations have to face many security issues, i.e., reliability, privacy, and protection. So, the main objective of this research question is to analyze the key elements and develop a blockchain-based solution for the certain research problems.
RQ2.	What are the different applications of blockchain-based solution in our daily life?	Blockchain plays an essential role in the financial industry, and the core objective of this question presents the significance of blockchain-based solution in our daily life.
RQ3.	What are the key challenges that are currently faced in blockchain-driven application?	This research question emphasizes on categorising different types of challenges currently faced in the blockchain implementation.
RQ4.	How block-based solution have revolutionized the banking and financial industry?	Based on the literature, this research question purposes to revolution of the blockchain technology and provide solution to the financial sector and banking.

articles by their titles, abstract, and content provided; (6) quality assessment and evaluation; (7) analysis and identifying the gaps in the extant; and (8) conclusion and recommendations. In Figure 1, each of these steps is fully described.

3.1. Selection of Research Domain. Research papers from different online digital libraries were systematically studied to identify the concept of blockchain, discover the problem linked to the selected domain, and find out the solutions of various problems so far that what the researchers have examined.

3.2. Research Question Formulation. SLR is another method for critically assessing a given situation. Several features exist for AI-based platforms to be examined critically. Most relevant papers, book chapters, conference proceedings, and journals were deliberated at the primary stage that clearly defined blockchain application. Our initial study identified the problem faced in the selected domain. To bring out the research result, the proposed research emphasizes some research questions given below that are extracted based and helps the assessment from various papers and articles to make this SLR an effective search.

3.3. Research Questions. The research questions (RQ) are an essential part for every SLR work. Identifying the most suitable and relevant questions ensures the accuracy and relevancy of the SLR work. To explore the most relevant questions, we have formulated a set of four questions to conduct this SLR work in the proposed area from various aspects. The aims of the research questions are described in detailed in Table 1.

Table 2: Article selection process and development of the final database.

Online library	Filter articles on title bases	Filter articles on abstract bases	Articles selected on contents provided bases
IEEE Xplore	337	134	48
ScienceDirect	112	42	11
Hindawi	213	67	23
Springer Link	311	59	31
Total			113

3.4. Keyword Identification. After finalizing the set of RQs, the next step is to formulate the most relevant keywords that exploit relevant paper from the online libraries. The completed best relevant articles retrieved are as follows: "BLOCKCHAIN, BITCOIN, DIGITAL CURRENCY, CRYPTOCURRENCY, SECURITY THREATHS, CROWD FUNDING, CHALLENGES, ISSUES, DILEMMAS". The finalized keywords are used to develop a set of query related to the required database and modified further for the best outcomes (for obtaining most relevant results from the suitable articles).

3.5. Query Selection. To find out the best outcomes from the articles, an accumulation process is selected from the online libraries; the formulated queries are ("BLOCKCHAIN" OR "CRYPTOCURRENCY" OR "BITCOIN" OR "DIGITAL CURRENCY") AND ("SECURITY" OR "SAFETY") AND ("CROWD FUNDING" OR "FINANCING") AND ("CHALLENGES" OR "ISSUES" OR "DILEMMAS"). These queries are further changed based on required results and the selected online libraries. Based on the title, substance, and abstract of the research article, the most relevant 113 articles and research publications are preferred. The full description of the accumulated research articles is defined in the following subsection.

3.6. Digital Library Selection for Article Accumulation. To gather the most pertinent research articles for the proposed SLR work, we chose four of the most popular peer-reviewed online libraries including ScienceDirect, IEEE, Hindawi, and Springer Link. Overall, the most relevant 113 research articles are selected for evaluation and assessment expect. The description regarding final database infrastructure and suitable articles chosen is described in Table 2.

A total of 113 articles are selected for the analyzing and assessment purposes. The total finalized articles have contributed in this last pool from the various online peer-reviewed repositories shown in Figure 2.

Figure 3 represents the overall impact of the selected online libraries in the finalized suitable research articles. After assessing the proportion contribution, it was concluded that IEEE Xplore and Springer Link contributed the most, which shows the interest of researchers to publish their work in these repositories.

With the increase in the technology, blockchain has become an emerging and attractive domain for the research around the world. The researchers extensively exploited blockchain and cryptocurrency in various domains including banking, financial sectors, healthcare, education, IoT and smart contracts, and Internet security and privacy, to ensure the business profitability of the organization and industries. Keeping in mind about these applications, the researchers exploited these models in banking, financial sectors, and many others to ensure high integrity, privacy, decentralization, and security of the organizations. Figure 4 explains the annual contribution of various research articles in the proposed domain based on the selected research questions.

After assessing the results as shown in Figure 4, it is identified that the number of research articles tremendously increases showing that the research community keenly explores the proposed domain. The trend shows that after 2019, the number of articles exponentially increased that indicates the interest of the different organizations to ensure high privacy and security for its assets.

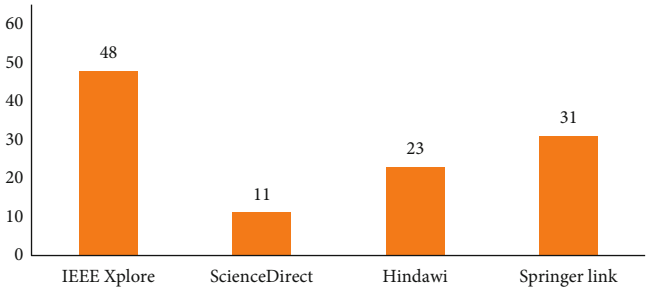

Figure 2: Number of publications from online database.

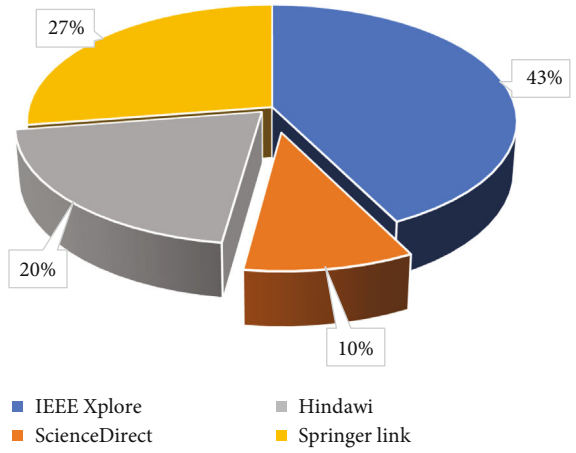

Figure 3: Percentage contribution of each library.

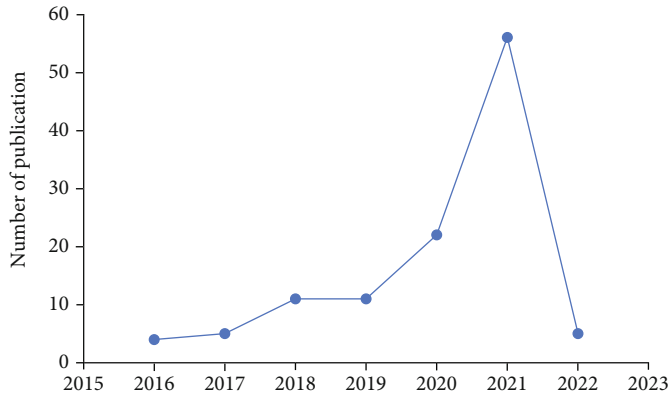

Figure 4: Year-wise sorting results.

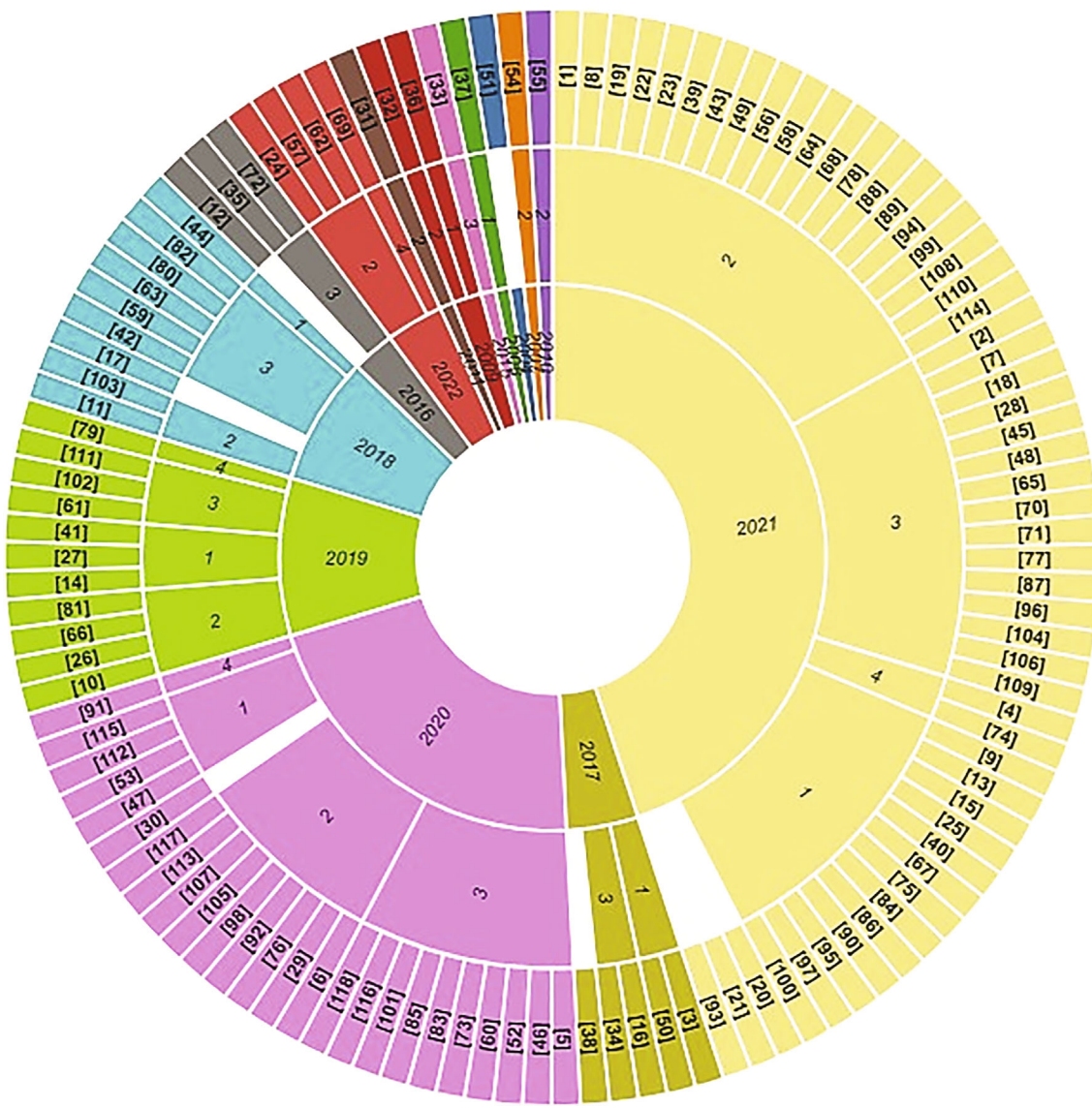

Figure 5: Quality assessment and evaluation representation of the final pool.

Table 3: List of key elements in the literature.

S. no	Key elements	Description	References
1.	Privacy	The purposes of this paper in terms of security and privacy of telecare medicine information systems and e-health were also analyzed and appraised.	[18, 19, 41, 57–59]
2.	Sharding	In this article, researchers examine how Ethereum, a well-known blockchain system, will response to sharding.	[44]
3.	Information management system	This study proposes and constructs a blockchain-based intelligent power material storage information management system.	[60]
4.	Efficiency	This study offered interesting undeveloped blockchain solutions, including those for blockchain efficiency, security, creditworthiness, performance, supervision, privacy, and online-to-offline integration.	[61]
5.	Conceptualization	In this paper, author presents perspectives from a heterogeneous collection of practitioners at the cutting edge of blockchain conceptualization, deployment, and development.	[62]
6.	Interledger technique	Study focuses the interledger methods, which are critical for allowing large-scale blockchain networks and ensuring scalable interconnection across different, distributed ledgers.	[63]
7.	Solidity programming language	The paper suggests that the smart contracts are written in the solidity programming language. A private Ethereum network hosts this blockchain and intelligent contract-based platform.	[64]
8.	Structural optimization factor model	This research proposes an intelligent contract structural optimization factor model. The gas optimization theory is used to optimize the structure of blockchain intelligent contracts by modifying the order, limiting the usage of expensive EVM data fields, eliminating duplicate fields, and optimizing intelligent contract algorithms.	[39]
9.	Bibliometric method	This study intends to investigate using the bibliometric technique, research trends, and collaboration in the field of blockchain IoT. According to the findings, the number of publications in this sector has grown dramatically.	[65]
10.	Artificial intelligence	In this article, researchers provide a thorough examination of how blockchain might improve artificial intelligence in these four areas.	[23, 66]
11.	Cryptography	Based on this paper with previous research, the application of material circulation under the emergency condition is investigated and enhances the blockchain with smart contract technology and cryptography.	[67]
12.	5G networks	The authors go on to look at the possibilities of blockchain in 5G networks and beyond artificial intelligence, as well as open up new research areas for upcoming blockchain-enabled SAG-IoT systems.	[68]
13.	Distributed systems	In this paper, researchers begin by dissecting the main components of blockchain technology and demonstrating the features of each of these components in the context of distributed systems.	[69]
14.	Traceability	The paper has proposed that it requires traceability implementation to solve existing issues of information asymmetry and low visibility is the textile and garment industry.	[70, 71]
15.	Transparency	In the article, author discusses the data, supply chain, feasibility, transparency, traceability, application, integrity, automobile, privacy, and manufacturing.	[71]
16.	Decentralized	This paper delivers to use blockchain to enable decentralized AI applications, such as safe data sharing, data privacy preservation, and providing trustworthy AI decision.	[24, 72–74]
17.	Practical scalability and applicability	In this paper, researchers offer a realistic scalability and applicability evaluation of the Quorum blockchain and its consensus algorithms.	[75]
18.	Symmetric encryption and ring signature	The study covers to safeguard transaction data and users' identities, symmetric encryption, and ring signature which are utilized. To demonstrate the validity of data redaction, the transaction sender might expose the names and transaction data of the invalid users in an anonymous environment.	[19]
19.	Intelligent contract	The authors propose and elaborate three application scenarios for blockchain-based intelligent contract technology in the supply chain factoring business, focusing on the division and transfer of creditor's rights certificates, upstream supplier factoring financing, and core enterprise due payment, as well as their implementation processes.	[76]

Table 3: Continued.

S. no	Key elements	Description	References
20.	Reliability	This research examines the reliability and significance of blockchain in smart cities of the future.	[77]
21.	Data integrity	The paper offers a blockchain technique for securing the network slice (NS) administration layer. This process assures the NS settings' data integrity and dependability.	[78]
22.	Protection	The paper describes a privacy protection structure for blockchain that implement in the multiasset model and account.	[79]
23.	Verifiability	The study enables to remove particular blocks while keeping the blockchain's verifiability.	[15]
24.	Scalability	The prospects of success of some generalized blockchain models, such as network effect scalability and future client-side use, are weighed in this article.	[80]
25.	Crowdsensing systems	In this study, the researchers build on the original research effort by looking at a new design point for bridging public blockchain with crowdsensing systems and offer a paradigm for developing blockchain-enabled crowdsensing systems that are resilient, verifiable, and private.	[81]
26.	Measuring instruments	In this paper, writers examine how blockchain might aid in the resolution of such issues and also compare to the traditional measuring instruments and distributed measuring models discussed and provide a conceptual model for implementing measuring instruments in a distributed blockchain-based architecture.	[82]
27.	SWOT analysis	The study explains the strengths, weaknesses, opportunities, and threats (SWOT) analysis in the construction supply chain by using blockchain technology.	[83]

3.7. Quality Assessment and Evaluation. After defining a set of final some relevant and suitable articles, the next main point is to evaluate all the relevant articles based on precise measures defined [56]. A quality criterion has been proposed for the SRL work for assessment purposes as given below:

(i) 1 if an article is satisfying the research question

(ii) Meanwhile 0 if an article dissatisfy to research question

The overall information regarding the set of relevant articles is detailed in Figure 5. It contains the information about the references, publication year, and so on. The outer shell in Figure 5 depicts the relevant article accumulated for the assessment process. The second last shell represents the average weighted value. A higher weighted value represents the relevancy of a certain articles with the targeted research problem.

The last shell represents the year-wise publication of the most relevant articles. In Figure 5, the trend shows that since 2019, the publication number increases in the domain, and 2021 reflects that the researchers have high contribution in the maturity of this field.

4. Results and Analysis

This portion of the paper analyzes the outcome of this SLR work. The suitable articles and their highlighted explanation against each research query are described in detail as below.

What are the key elements that must be considered for developing a blockchain-based solution for a certain research problem?

This research question has outlined key elements to develop a blockchain-based solution for the research difficulties. In this technological age, security is a prime concern for many departments including both government and nongovernment organizations. The ever-growing advancements in technology have emerged security concerns for these organizations. The main objective of this research question is to summarize different factors described in the extant and figure out what type of new elements are available to insure and protect to the blockchain technology. Table 3 depicts the list of various types of key elements for research problem.

What are the different applications of blockchain-based solution in our daily life?

Blockchain has various impacts on our lives and has offered numerous state-of-the-art applications in various fields. It secures the human privacy by introducing automated applications in many research fields such as banking, financial industry, network security, and healthcare. Table 4 shows the list of application of blockchain-based solution in our daily life.

What are the key challenges that are currently faced in blockchain-driven applications?

This research question has suggested different challenges of blockchain to secure the systems by using blockchain capabilities. The prime objective of this research question is to outline the currently challenges of blockchain-driven applications. Table 5 shows the list of different challenges proposed in the research.

How block-based solutions have revolutionized the banking and financial industry?

Table 4: List of impact of blockchain in the literature.

S. no	Application in daily life	Description	References
1.	Education	The aim of this study is to provide blockchain technology that never-before-seen precision, dependability, and immutability. This foundation of clear, verifiable data will be utilized to fuel blockchain-based apps in the future. As a consequence of our effort at a varied, comprehensive, and decentralized perspective of educational performance, we assure the best e-learning outcomes for both students and teachers.	[8, 40, 84]
2.	Tradeoffs	This article covers several existing and future merged mining, scalability, network effect, fragmentation, and generalized blockchain techniques, as well as tradeoffs in the strategy and applications of blockchain systems that aim to give universal functionality.	[80]
3.	Power material logistics	The logistics information collecting device is created and implemented in the logistics information system of power firms to get information in real time.	[85]
4.	Multiasset model	The paper proposes asset transmission and double-spending detection methods, as well as the anonymous addresses, anonymous asset information, and transaction structure in blockchain system which implement in accounts and multiasset model.	[79]
5.	Tourism industry	The use of innovation in the IT technologies in the tourism industry has been proposed by focusing the blockchain-based technology in destination management organizations (DMOs).	[86]
6.	Drug production	This study enlisted the help of pharmaceutical businesses to provide feedback on blockchain technology for medication manufacturing records. The resulting technology known as blockchain can be utilized to track medication manufacture.	[87, 88]
7.	Space-air-ground	This study provides a thorough examination of the use of blockchain technology to secure space-air-ground IoT applications.	[68]
8.	Diamond industry	The study explains the implementation of blockchain in diamond industry, as well as the benefits and drawbacks of this integration.	
9.	Construction supply	The research demonstrates the needs for, and stages toward, a blockchain-enabled construction supply structure.	[83]
10.	System architecture	In this research, author presents a novel architecture known as the dual-channel parallel broadcast (DCPB) model, which might solve such an issue to a higher degree by utilizing three methods: parallel pipeline processing, block broadcast approach, and dual communication channels.	[14]
11.	E-health	The network slicing idea is proposed to provide a solution for nonpublic networks (NPNs) in e-health contexts that meets quality of service (QoS) and privacy criteria across slices. In addition, a blockchain technique for securing the network slices (NS) administration layer.	[59, 78]
12.	Distributed computing systems	The study proposes a novel blockchain-based mechanism for delegating rights inside distributed computing systems that is devoid of the flaws seen in prior methods.	[89]
13.	Business process	Researchers demonstrate how to develop and conduct interorganizational business processes utilizing blockchain. Further, they demonstrate the ideas and reasoning of the model-driven approach to business process automation on blockchain in particular and then report on recent achievements in the field.	[10, 26]
14.	Project management	In this article, the researcher first examines the most recent blockchain applications in project management to disclose the present level of blockchain research and suggests blockchain implementation in the areas of project management. Secondly, it offers a framework to advice implementers and researchers on blockchain privacy, design decisions concerning blockchain type, transparency, platform considerations, and decentralization that are distinctive to a certain project management field.	[90]
15.	Business sector	The primary goal of this research is to present and explain the idea of blockchain in the business sector, its existing commercial applications, and the different dangers and security challenges associated with blockchain technology.	[45]
16.	Society	The study aims to demonstrate how blockchain might restore promised qualities of the previous two waves of digitalization and traits that were lost due to centralization tendencies caused by business models that are independent of the underlying technology and also discusses the technology's decentralization and the issues it brings to organizations and individuals.	[91]

Table 4: Continued.

S. no	Application in daily life	Description	References
17.	Data quality assessment	This paper sets the stage for future study by contextualizing the issue of data quality in blockchain, exploring ways to extend or modify blockchain technology to facilitate data quality evaluation, and highlighting a set of obstacles.	[46]
18.	Academic entrepreneurship	According to the research, the economic service function of colleges and universities to regional economic and social development is becoming more prominent, resulting in a scale effect; pure technical efficiency, academic entrepreneurship efficiency, and scale of universities and colleges in various regions are all improving, with an upward trend; academic entrepreneurship activities of universities and colleges in various regions.	[65, 92]
19.	Industrial Internet of Things	The article provides a comprehensive overview of Blockchain Industrial IoT and analyzes all pertinent features of this innovative idea.	[49]
20.	Smart grid	This study investigates the structure and implementation of blockchain-based technology in smart grids in order to integrate it with smart grids and develop a sustainable supply chain.	[48]
21.	Smart cities	This research demonstrates the reviews and relevance of blockchain in smart cities of the future. Due to their powerful qualities such as reliability, decentralization, transparency, and authentication, it can help smart cities thrive.	[39, 77]
22.	Aviation industry	The paper presents the key factors offered by blockchain technology in the aviation industry and also highlights layer-by-layer services and interface among aviation system mechanisms.	[93]
23.	Insurance contract	This article proposes a framework for using smart contracts for insurance agreements and storing them on the blockchain. If the claim occurs, all of the determined requirements are satisfied, and the transaction occurs; then, it is disregarded.	[64]
24.	Auto insurance	This article suggests to enhance the present vehicle insurance claim system, a blockchain-based vehicle insurance data sharing scheme. The plan is comprised of four primary bodies: the owner of car, insurer, 4S workshop, and the government body.	[94]
25.	Vehicle industry	Study examines the state of blockchain in the vehicle industry and discusses hot themes.	[71]
26.	Manufacturing industry	This article primarily highlights common patterns in blockchain-based IoT technology concentrating on essential themes and by comprehending the integration of IoT and blockchain technology.	[7]
27.	Healthcare	The motive for using of blockchain technology in the healthcare business has been proposed. The application of blockchain technology in healthcare is rapidly expanding, and it is having a massive influence on the healthcare business. Stakeholders, hospitals, clinics, patients, and other medical may exchange data and promote interoperability by using blockchain to manage and distribute electronic health and medical records.	[18, 50, 62, 95–97]
28.	Textile and clothing industry	This paper explores and offers a blockchain-based traceability framework in multitier textile and garment supply chains in this setting. On organizational level, it intellectualises the interaction of supply chain partners, as well as associated network architecture, at the operational level.	[70]
29.	Supply chain management system	In this study, seven main issues have been identified in SCM's basic operational aspects, such as logistics, distribution, supplier, manufacturer, and customer.	[98]
30.	Food supply chain	The suggested approach discusses the food supply chain management systems and leverages Ethereum smart contracts, which eliminates fabricating data, external threats, and corrupting databases.	[99]
31.	Vehicle maintenance	The study shows the use of blockchain technology in the vehicle spare part maintenance to provide benefits and carry out the automobile industry.	[100]
32.	Internet of vehicles	The paper expedites the blockchain-based system for privacy and protection of Internet of vehicles.	[101]
33.	Energy systems	This article discusses prominent energy blockchain application scenarios, evaluates generic blockchain limits and their implications on energy systems, and investigates alternative solutions to these limitations for future blockchain-based energy systems.	[24]

Table 4: Continued.

S. no	Application in daily life	Description	References
34.	Internet of Things (IoT)	The use of blockchain technology to the Internet of Things (IoT) remains a significant problem. A lightweight and high-throughput consensus method paired with blockchain technology to satisfy the actual demands of IoT.	[4, 5, 19, 58, 65, 66, 102, 103]
35.	Power trading system	The paper describes the AdaBoost algorithm which is used to forecast power trading node supply and demand gaps.	[104]
36.	Integrated project delivery	The study's findings used in a favourable external environment would facilitate IPD uptake and utilization across the architecture, engineering, and construction (AEC) sector by giving a feasible answer to present financial constraints. The results broaden the scope of future study into blockchain's ability to address problems similar to those afflicting the AEC sector.	[105]
37.	Game theory	In this study, researchers emphasize the intersection of blockchain and game theory, including game-theoretic assaults, rational mining tactics, and rational smart contracts.	[47, 106]
38.	Medical imaging	In this study, the ideas and principles behind medical imaging technology and applications are examined.	[107]
39.	Supply chain	This study examines the relationship between blockchain technology and the supply chain factoring sector.	
40.	Editorial management system	This study presents TimedChain, a functional blockchain-based editorial management system, for handling the peer-reviewed process and submission to publication.	[25]
41.	Smart contracts	The research examines how rational actors engaged in blockchain select their methods based on economic incentives to maximize their utility and provide benefit and significance of the smart contracts.	[47, 66, 108]
42.	Internet	The paper explores the factor of blockchain's compatibility with other upcoming Internet technologies and the influence of blockchain on those technologies.	[69, 74]
43.	Patents	The research focuses on patent publishing patterns, descriptive analysis and important technological categories for the data, and citation analytics for top patents and companies.	[109]
44.	Music industry	In this article, authors create smart contracts on public-permission-less blockchain to defend the music industry from the repercussions of illegally downloading copyrighted music files and provide a decentralized music file sharing network where the owner of music file may post music files and music lover can download the required music.	[110]
45.	Measuring instruments	The paper suggests a conceptual model for implementing measuring instruments in a distributed blockchain-based architecture, and it has been compared to traditional measuring instruments with the current distributed estimating models.	[82, 111]

The Industry 4.0 revolution includes a wide range of technologies such as 3D printing, cyberphysical systems (CPS), Internet of Things (IoT), cloud computing, and blockchain and artificial intelligence (AI). The benefit of these disruptive technologies is their capacity to self-learn, to be secure, and to forecast in dynamic environments [2]. The immutability of data recorded on the ledger is ensured by the architecture of blockchain technology, which assures that no single corporate entity may edit, remove, or even append any record to the log without the consent of other network members [63]. A good bank is not merely the society's financial heart, but it is also obligated to help the familiar people better their economic situations in every way feasible. Blockchain technology is a distributed, decentralized ledger that keeps track of all transactions. Blockchain technology and distributed ledger have advanced significantly to provide best solutions for a wide range of industries, particularly the financial sector. Banks, as the country's financial cornerstone, are obligated to improve society's overall economic status. The study seeks to investigate existing methods and governance structure weaknesses, and it gives insight into how blockchain might reorganize governance in banks [114]. Blockchain applications also encourage the development of "multicentre, weakly intermediated" scenarios, which will improve the banking industry's efficiency [72]. With the emergence of blockchain technology and advanced technological approaches, the Central Bank Digital Currency (CBDC) is focusing on technology empowerment, interests of financial consumers under new business models, and planning for protecting the rights; building data transaction, strengthening data governance, and privacy protection mechanisms; actively innovating regulatory approaches and deepening international cooperation to meet upcoming challenges; focusing on technology empowerment; and developing the system for protecting the interests and rights of financial customers under new business models. Wholesale CBDC and retail CBDC are two types of central bank

Table 5: List of challenges reported in the literature.

S. no	Challenges	Description	References
1.	Security	This study investigates the privacy, security, and policy challenges raised by this hybrid architecture to grasp the convergence and comprehend the integration of IoT and blockchain technologies.	[7, 18, 45, 59, 65, 82, 94, 111]
2.	Confidentiality	This study examines blockchain-based solutions for a variety of security services. Services include confidentiality, access control, privacy, authentication, integrity assurance, and data and source provenance.	[11]
3.	Access control	The paper analyzes the information security problem from data protection and access control to implementation with the emerging blockchain technology.	[43]
4.	Spam attacks	In this paper, a "spam attack" approach for parties with enough bitcoin holdings to delay a statistically significant share of transactions made to the Ethereum network.	[103]
5.	Scalability	The paper outlines the critical technological difficulties that must be addressed before it can reach its full potential, such as performance, cross-chain interoperability, and scalability.	[69]
6.	Integrating	The article discusses the real-time challenge of integrating blockchain in the diamond industry.	[112]
7.	Recommender systems	This article explains a comprehensive outline of blockchain-based recommender systems, including problems, unresolved concerns, and solutions.	[57]
8.	Applications	This paper delivers and describes the implementation of the blockchain in the business sectors to secure the business activity.	[45]
9.	Robotics	The study begins by delving into the major criteria and technological obstacles that robots face in general. Following that, it gives a full understanding of blockchain technology in an instructional format.	[9]
10.	Safety	The study covers the combination of blockchain technology with Internet of vehicles system and to provide an efficient and safe two-way authentication method.	[13, 101]
11.	Algorithms	The paper analyzes the consensus algorithms, which are critical components for blockchain decentralization. Researchers identify three major consensus algorithms, including PoP, Paxos, and PoAH, that are better suited for establishing consensus on such a massive scale blockchain-enabled Internet architecture.	[74, 113]
12.	Adoption	Researchers recognize and discuss significant research challenges impeding blockchain adoption in the healthcare industry.	[95]
13.	IoT system	The study discusses the many problems that an IoT system faces and summarizes the benefits of incorporating blockchain into IoT infrastructure. The study also explains the specially interest in demonstrating blockchain applications in IoT with better capabilities and security.	[102]
14.	Acceptance	The paper gives a more in-depth look at the key features of the blockchain, as well as the prospects for application in the management of big data in healthcare and the barriers to its acceptance in the healthcare perspective.	[96]
15.	Integration	This article attempts to map the requirements and features of both systems and point out the critical coexistence difficulties and technology options for more seamless combination of IoT and blockchain.	[4]
16.	Threats	The paper discusses the architecture, features, and security threats of space-air-ground- (SAP-) IoT systems and focus on the capable blockchain-based solutions for SAG-IoT security.	[68]
17.	Implementations	In the article, the core challenge is to implement issues such as public vs. private key access, distributed ledger size restrictions, speed, complexity, and security risks.	[13, 107]

digital currency. When compared to the wholesale CBDC, existing payment system offers benefits such as speedier delivery and some anonymity and provides cheaper transaction costs, which give help to improve cross-border payment efficiency [115].

First, there is blockchain 1.0 technology. It primarily reflects to programmable currency, which is extensively utilized in electronic currency, payment and settlement, and so on. Second, there is blockchain 2.0 technology. It is an abbreviation for programmable finance. It is typically utilized in financial transactions, such as financial derivatives, private equity, and stocks [69]. The application of blockchain technology in the process of accounts receivable processing, information integration, information supervision and convenience, credit transmission process, chattel pledge management, financial financing process, service platform operation, and other links drives the expansion trend of blockchain technology in supply chain finance [116].

Blockchain technology began as distributed ledgers for bitcoin and has now evolved into a financial technology (FinTech). For a while, it was overshadowed by the bitcoin craze, but in several years, it has begun to gather lot of attention and is quickly becoming a vital technology in the FinTech family. Many professionals and academic scholars have recognized that the effect of blockchain technology extends beyond the financial industry and even bitcoin to drive change in a wide range of sectors [117]. Currently, blockchain is a topic that is receiving a lot of interest in financial technology (FinTech). It incorporates several computer technologies like point-to-point transmission, distributed data storage, encryption methods, and consensus procedures [72]. With the advent and expansion of bitcoin and Ethereum over the last decade, an increasing number of firms, from FinTech to retail, have shown an interest in incorporating blockchain-based solutions into their application portfolios [75]. Trust may lead to successful enterprises via financial tools and tactics. A trustable platform is an essential component of the financial system used to determine whether or not a user can be trusted. FinTech (Financial Technology) is the combination of finance and technology. FinTech and blockchain are popular topics among financial technology executives today. The FinTech-assisted applications and blockchain technology-based data encryption have revolutionized the regulatory organizations with a full spectrum [118].

Decentralized financing assists in identifying the possible difficulties, current business models, and other security constraints. It is considered as a new era of financial technology that has the potential to transform and modernize the traditional financial structures by providing a new canvas for entrepreneurship and creativity. Blockchain technology enables decentralized financial services in the financial sector, which are more inventive, interoperable, decentralized, transparent, and borderless [73].

5. Conclusions

Blockchain is a new technology that deserves more research. It has exposed emerging capabilities in various domains, specifically in banking, financial, and other regulatory sectors. The paper assesses a systematic literature review, develops a classification of blockchain application domains, and identifies key contributions in risk solution by using the blockchain-based technology. The analysis shows that blockchain's unique and innovative qualities provide a significant potential for creating trust, lowering disputes and claims, enhancing communications, and precluding fraud in the financial industry. However, the advantages and qualities of blockchain for a specific application, on the other hand, are determined by technical decisions. The aim of this paper was to give a thorough examination of blockchain applications in our daily life. Our review of existing work assists us in identifying the benefits and limitations of using blockchain technology into different sectors especially in the financial and banking industry. Although this technology is still in its early phases of development and must undergo testing, it has the potential to more innovation in the future. Based on the findings of this systematic mapping, new research directions are suggested to ensure high privacy, transparency, and reliability in the blockchain-based systems.

Blockchain has changed the decision tactics of organizations. By using the capabilities of blockchain in various industries, the data can be secured and decentralized. The suggested framework can help researcher and implementers make technical design decisions in the creation of blockchain systems for a certain domain, such as privacy, decentralization, platform selection, blockchain type, and transparency. The study's key contribution is a complete review and classification of relevant research publications on blockchain and their integration into various trends and applications, as well as the identification of specific literary trends. The blockchain platform enables the creation of a decentralized application in which the pattern of data exchanges is not influenced by any third party. The data transactions of the entities are recorded in a decentralized database in a verifiable, secure, immutable, and transparent way, complete with time stamps and other necessary information. During the initial phases of development and design, many studies have suggested solutions that have the potential to boost operating efficiency and data transparency. However, the privacy scalability and security of blockchain-based technology will demand further research before large-scale commercial implementation. As a result, a review of current blockchain research in our field of financial services and banking is required to identify specific research gaps that must be addressed in future studies.

6. Implications

This paper has many implications in our daily life especially in the banking and financial sectors. By exploiting the capabilities of blockchain technology in different fields, the effectiveness of various activities will be boosted. Organizations can be protected with the help of blockchain and hybrid technologies and protocols. The blockchain technology implementation to different industry should be made a strong policy choice that guaranteed security, efficiency, and privacy.

Data Availability

The data used to support the findings of this study are included from peer-reviewed online repositories, and all the articles are mentioned with full references.

Disclosure

The results obtained herein are solely the obligation of the writers.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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