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Market trends and analysis of blockchain technology in supply chain

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Technology is an important tool in the armory of state-of-the-art innovations, in terms of both digital expansions and disruptions. With blockchain technology gaining momentum, different industries are emphasizing experimentation with it. Nowadays, organizations are emphasizing towards agile and leaner supply chains with end-to-end prominence *via* the incorporation of this latest technology, thereby boosting services across the world. The revolutionary features of blockchain technology are paving the way for greater opportunities for supply chain businesses. The technology has the potential to become a supply chain data utility and repository that offers benefits to all its users, such as unique market information that would be otherwise unavailable from any other source. This paper contemplates the need for blockchain technology in the supply chain and its contribution to enhancing the overall efficiency and demand planning processes of businesses. It discusses the latest market trends and factors driving the need for the incorporation of blockchain in the supply chain sector and the future scenario. Different use cases of the technology, market challenges in the implementation of the technology, and the solutions offered by different companies to address such problems have also been discussed.

KEYWORDS

blockchain technology, supply chain, market, technology, analysis

Introduction

With the notions of sustainability, fair trade, and transparency gaining influence in customers' purchase decisions, businesses are increasingly putting emphasis on redefining end-to-end supply chain operations. Rising digitalization is expected to revolutionize the way goods move and relocate through various network layers, from acquiring raw materials to the stages of production and distribution of products (Ghosh, 2019). In order to remain competitive in today's digitalized world, it has become necessary for organizations to emphasize the ability to swiftly cater for the changing business scenario.

Contemporary experts are cynical about the supply chains' data or information because of the transparency issues and challenges in tracing and tracking them (Prabhugaonkar, 2022). Supply chains are thereby focusing on technology-led reinvention, with blockchain and the Internet of Things (IoT) paving the way towards the formation of a digital system that responds to the changing demand and supply scenario (Liu, 2018). The blockchain serves as an enabler for the shift towards the connected state of digitalized supply networks. It offers capabilities such as auditability, invariability, and disintermediation with immense potential for different supply chain issues (Killmeyer, 2019).

A supply chain powered by blockchain infrastructure is expected to offer diversified possibilities with potential application areas. The integration of blockchain and IoT

technology into the supply chain stages enables enhanced accountability, traceability, transparency, and coordination during transactions. This integration is gaining significant traction, owing to the fact that it helps to increase the traceability of the process, enhances compliance and visibility over outsourced contract manufacturing, and minimizes the losses from the counterfeit market. In supply chain processes, the technology to be implemented can be either private or permissioned blockchain, directing the user's writing and reading capability to them. The technology empowers even small interest groups and businesses to commute data safely and securely, thereby gaining unparalleled confidence and trust.

Hence, the implementation of blockchain creates immutable transactional records in supply chain processes, making it a seamless one. Factors such as the increasing need to control issues of data leakage and breaches and rising digitalization are expected to play a pivotal role in the growing need for blockchain in supply chain processes. Inclusion of blockchain technology thereby builds larger collaborations and trust, thus enabling businesses to cater to the changing market conditions.

Research questions

RQ1: Is there a need for blockchain technology in the supply chain?

RQ2: What are the use cases of blockchain in the supply chain and the key players adopting them in their businesses?

RQ3: What are the recent factors and trends for blockchain technology in the supply chain industry?

RQ4: What are the risks associated with the implementation of the technology?

Purpose of the article

At present, supply chain networks are facing a significant rise in demand to integrate suppliers and customers. The integration of blockchain technology in the process offers solutions to manage the associated risks. This paper illustrates different factors that are bolstering and restraining the market growth of blockchain in the supply chain segment. Furthermore, it also discusses future technology implementations with a brief description of the strategies adopted by different segments and businesses.

Key findings in the research

Finding the right suppliers to cater to business requirements is expected to be costlier and time-consuming. For businesses focusing on embracing and investing in different aspects of supply chain management, blockchain technology plays a pivotal role in unleashing profound results with its improved market position.

Hence, the incorporation of blockchain in the supply chain enables companies to reimagine the nature of their businesses and accordingly plan their strategies and cater to the changing competitive scenario.

Literature review

One of the prime focus areas in supply chain management processes is empowering a set of recognized parties to conduct transactions with each other directly with guaranteed contract compliance, optimized costs, and enhanced security. With the increasing demand for enhanced transparency alongside the growing supply chain complexities, the need for an inexpensive and effective method for tracking every step in the process is becoming an essential factor. Industry 4.0 and all the related revolutions are incessantly engaged in shifting from a manufacturing focus on goods towards data-driven products and services, which require strategic placement of information technology, particularly in the segment of supply chain management (SCM) (Zhong, 2017).

Blockchain, which is one of the largely embraced technologies, offers several improvements and gains in combination with the concepts of Industry 4.0. The technology is a decentralized ledger engaged in recording transactional information among numerous parties funded by a cryptographic value (Choi, 2021). It is a distributed, decentralized, and pioneering technology that aims to maintain the availability, integrity, and confidentiality of all the information and data it holds (Dutta, 2020, October). It has been adopted in the manufacturing and financial sectors to enhance efficiency and optimize processes in other aspects (Jabbar, August 2021). A collaboration of the concepts of IoT and blockchain technology represents one of the latest technologies, which is being increasingly adopted by businesses within their strategies, thereby catering to the changing competitive scenario. This shared ledger technology offered by blockchain enables users in a business system to efficiently record the transactions that cannot be otherwise altered.

Blockchain in supply chain processes "tokenizes" various transaction-relevant information, thereby producing readily and uniquely certifiable identifiers for bills of lading, inventory units, and purchase orders. Through its innovations, blockchain technology possesses the potential to completely transform business strategies and models. The implementation of this technology enables the effective coordination of activities, easy monitoring of operations, and quick settlement of transactions.

Need for blockchain in the supply chain

At present, with the growing demand for blockchain, several startups and large corporations are placing emphasis on discovering its usage in sectors other than financial services. The implementation of blockchain in supply chain processes offers enhanced transparency, with minimal risks and costs. It also provides all parties with access to the same information, possibly minimizing data transfer or communication errors (Laaper S. a., 2017).

As more supply chains nowadays have been revolutionized into digital networks, their capability to involve and connect has become a reality. The technology enables organizations to completely digitize their physical assets, thereby generating a distributed immutable record of all transactions and making it convenient to track the resources from the manufacturing to the distribution facilities. Participation in any blockchain requires a digitally enabled ecosystem, and as more supply chains are transformed into digital networks, their ability to engage and connect becomes a reality.

There are numerous benefits offered by incorporating blockchain in supply chain processes.

Primary benefits:

- Enhances the traceability of the material supply chain to cater to corporate standards
- Lesser losses from gray market trading or counterfeit products
- Optimization of administrative costs
- Enhances compliance and visibility over outsourced contract manufacturing.

Secondary benefits:

- Enhances public trust and the credibility of shared information
- Minimizes the possible risks in public relations from malpractice in the supply chain
- Reinforces the business reputation by offering the transparency of materials used in the goods.

The use of blockchain technology in supply chain processes provides a solution to the issue of the ways to cater to the complicated systems of suppliers and manufacturers at a time when agility, speed, and transparency are critical (Ganeriwalla, 2018). The technology enables the exchange of data to be significantly simplified and the processes to be designed more securely and rapidly (Schrauf, 2022). The applications with blockchain technology provide a radical and innovative communication path within complicated processes, thereby enhancing speed, security, and trust. The technology further offers the following:

Enhanced efficiency

The prominence of the technology enhances both the collaboration and communication processes for all parties. Better transparency features minimize the duplication of orders, wastes, and account payables such as rogue spending and fraud. Complete visibility of the financial data or information advances financing decisions for small-scale businesses with lesser processing time, risk, and uncertainty.

Better savings

Reductions in waste and stocks and increased efficiency are essential sources of cost savings with blockchain technology. A decentralized system that digitally shares transactions and resources minimizes the requirement for paper-based materials and workflows.

Sustainable and ethical sourcing

The tamper-resistance and traceability features of the technology make it simpler to validate the source from where the goods and materials come from and where they are distributed across the entire process (Higgins, 2021).

One of the best examples is the traceability of goods. The incorporation of blockchain within the supply chain supports a transparent, integrated, and smooth communication process.

Use cases of blockchain in the supply chain

Blockchain in traceability

Traceability plays an essential role in the supply chain processes of any business. At present, businesses are expected to enhance overall supply chain management by facilitating transparency and efficiency in the process (Laaper S. F., 2017).

The usage of blockchain in businesses helps to streamline the entire workflow by structuring the applications through which several parties can easily transact through a peer-to-peer network, without the requirement of a central authority to validate the transactions. The technology possesses the ability to solve any irregularities in the goods' traceability, thereby enhancing the efficiency, creditability, and safety of the overall process within the ecosystem (K, 2021).

The traceability factor significantly applies to food products and pharmaceuticals wherein robust storage and shipping of products are required. Below are listed examples that illustrate that the potential of blockchain to completely revolutionize the food segment in the future.

Bumble bee

Bumble Bee Foods, a North American company, is headquartered in San Diego. The company is engaged in providing a complete range of seafood products such as sardines, specialty protein products, salmon, and pouched and canned tuna under different brands such as Anova, Snow's, Beach Cliff, Bumble Bee, Wild Selections, Brunswick, and Clover Leaf. The company is engaged in the tracing of its seafood products.

In 2019, the company announced the launch of the SAP cloud platform blockchain service in its operations. This platform ensures greater seafood traceability and safety (because it is verifiable and incorruptible) across the supply chain (SAP News, 2019).

Walmart

In 2016, Walmart launched a blockchain ledger in partnership with Tsinghua University in Beijing, IBM, and JD. The platform enables the easy tracking of pork in the supply chain in China. The collaboration enables the development of necessary solutions and standards, thereby offering an overall streamlined and secured food ecosystem (Sristy, 2021).

As a pioneer in food safety across the world, one of the significant contributions of Walmart includes the "Walmart Food Safety and Collaboration Center". This initiative has led to investments in research into the safety of food products.

Furthermore, in August 2017, the company announced a partnership with Nestlé, Dole, Unilever, Kroger, Tyson Foods, and McCormick to develop applications that could enhance the traceability of food products. In 2019, Walmart conducted the first-ever usage of the technology to conduct end-to-end traceability for shrimps sourced in Andhra Pradesh, India, to retailers across the world.

The inclusion of blockchain technology enables the storage of data, thereby creating a history of the tamper-proof supply chain process, which is easily accessible by each participant.

Hence, the integration of blockchain technology in the traceability of products ensures transparency across the food supply chain, which is essential at present, especially with the rising occurrence of food adulteration across the world.

Blockchain in supply chain finance (SCF)

At present, supply chain finance is increasingly expected to enter the stage of intellectualization and informatization (Du, 2020, November). The complex system of the supply chain requires a centralized platform that is administered by a reliable intermediary in order to manage communication, collaboration, financial needs, and information exchanges between participants. Factors such as trust dependency, limited financial inclusion, maintenance of transparency, and high labor cost are expected to pose challenges to such centralized systems.

Implementing the revolutionary technology of blockchain in the supply chain finance process is expected to address such challenges and streamline the procurement to payment processes. Blockchain in the financing segment acts as an enabler to offer a clear communication platform with proven information across entities. The adoption of blockchain enables all the participants to share and monitor financial information with greater collaboration, enhanced security, transparency, and authenticity. A distributed database offers an exclusive source of reality between the seller and buyer, which helps to address communication trials and challenges (Asmussen, 2019, August). Blockchain technology enables real-time and reliable combined decision-making related to financing, thereby minimizing the cycle time and enhancing overall productivity (Kumar, 2020).

In order to streamline the transactional processes and to facilitate transparency and efficiency throughout, several players are engaged in launching several solutions. A few of these solutions are illustrated below.

Batavia

Batavia, an international trade finance platform, developed by the collaboration of IBM and five banks (Bank of Montreal (BMO), CaixaBank, UBS, Erste Group, and Commerzbank), is based on the “concept” of blockchain. The platform is engaged in backing up cross-border and multi-party trading networks, which can easily be accessed by different organizations across the world. In addition to this, the framework also focuses on digitizing and speeding up the conventional paper-based process, thereby increasing overall productivity (Keller, 2018). Hence, Batavia is expected to completely transform the business of companies.

Blockchain in combating counterfeiting

Counterfeiting is one of the most prevalent issues in supply chain processes around the world. Counterfeit goods account for nearly 3.3 percent of world trade, with estimates of its weight in the US economy at nearly USD 600 billion a year (Beaver, 2022).

Combating this issue is an essential factor for maintaining the health issues and financial losses at both the national and individual levels. Expanding these digitalization technologies enables businesses to streamline the interaction load between the value chain partners and consumers.

The implementation of blockchain allows brands to protect their goods from being counterfeited. Within the supply chain processes of any brand, the blockchain ledger helps to deal with varied activities, ranging from a mechanized agreement between the entities to smart contracts and production, distribution, and traceability facilities. Within a brand’s supply chain, a blockchain ledger can manage a variety of activities, from automating contract compliance between entities *via* smart contracts to manufacturing, tracking products, and distribution (Donekal, 2019).

The key market players are engaged in incorporating blockchain provenance *via* the use of smart tags, which helps to identify the place of the manufacture of any product, track the location, and allocate other related information to every step in the supply chain process. The different forms of smart tags include:

- Radio Frequency Identification Tags (RFID Tags): The RFID tags use radio waves to transfer the data to the readers and later receive the indication from an RFID tag.
- Quick Response Codes (QR Code): These codes are easily identifiable and read by tablets or smartphones, which are able to encode information such as internet addresses or phone numbers.
- Signatures on Ceramic or Metallic Surfaces: The laser marking machines etch graphics and barcodes onto ceramic or metallic surfaces. A few of the machines offer 2D data matrix metal tags, which enable the users to scan with a special scanner to perform the product tracing and data collection functions.

Amazon

Amazon announced the launch of a new Counterfeit Crimes Unit, which is dedicated to bringing counterfeiters trying to enlist fake goods in its supply to justice and, therefore, protecting the Amazon store from counterfeiting. In 2019, Amazon announced an investment of nearly USD 500 million for combating abuse and fraud, including counterfeit. Such efforts blocked nearly 2.5 million alleged fake accounts before they could make any single product obtainable for sale. This unit allows the company to efficiently follow civil lawsuits against alleged convicts, aid law enforcement officials, and closely work with the brands in independent or joint investigations (Amazon, 2020).

Blockchain is thereby engaged in offering solutions to the increasing problems facing the complex networks of suppliers and manufacturers at a same time when agility, speed, and transparency are crucial. Hence, the technology is a cutting-edge concept that can streamline all the steps and, at the same time, coordinate with different points of contact (Oracle, 2022).

Market driver bolstering the need for blockchain technology in the supply chain

Growing need for enhanced supply chain security

Along with the growing need for enhanced risk prediction and mitigation, the increase in attacks on supply chain processes, the rise in ransoms, the requirement for improved risk prediction and mitigation, a growing number of IoT devices in the supply chain, and an excessive increase in the adoption of automation technology are some of the factors that are increasing the demand for a supply chain security market.

With the increasing connectivity and complexity of supply chain processes, security is becoming a major factor of concern for businesses. In today's interlinked and complex world, security is no longer centered on one organization; rather, the entire network needs to be catered for. Undertaking a transformation in the supply chain process focuses on traceability solutions, data visibility, and governance, along with a few other security concerns that have been illustrated below.

Data locality

At present, it is very necessary for regulated businesses such as healthcare and financial services to have their data exchanged and acquired in compliance with government mandates and industry standards, which vary based on regions.

Data governance and visibility

Several business networks enable numerous enterprises, accessibility to data for seamless sharing, and intercollaboration. Contributing enterprises claim control over the information and the ability to decide whom to share it with and what can be viewed by the permissioned parties.

Data protection

It is very necessary for the data in the business transactions to be controlled and safely secured in order to avoid its tampering and breaching. Exchanging the data in a secure way includes trusting other sources, such as third-party sources, wherein it is essential to have assurance about the party being interacted with.

Hence, supply chain processes need a multi-layered approach, with significant strategies being incorporated by businesses to manage and mitigate risk in a seamless manner.

Market challenges restraining the incorporation of blockchain technology in the supply chain

Despite blockchain being a revolutionary technology, there are several challenges facing its adoption in supply chain processes.

One of the major challenges expected to restrain its deployment is the lack of enterprise (ERP) support or tools within the existing systems. It is still the case that few businesses are operational with structured and rigid ERP systems wherein it becomes challenging to back up the blockchain technology. Higher implementation and operational costs of the technology are also significant restraints

impacting its adoption by several enterprises. A few of the restraints are listed below:

Costs

Blockchain technology requires a transformation of the existing systems in an organization. Developing blockchain in a business requires costs associated with the hiring of the developers and maintenance, licensing, and planning costs, thereby making it a huge amount.

Regulatory scenario

With increasing technological developments, it is becoming essential for businesses to understand the different regulations and their impact on technology-enabled applications. Blockchain with higher privacy is able to surpass the government's interference in terms of management and appropriate laws. Hence, there might be certain legal restrictions required to be imposed on the users to minimize its worth. In addition to this, higher privacy concerns tend to make the blockchain vulnerable to scammers who pose a threat to this (Guo, 2016), (Min, 2019).

Scaling

The solutions offered by blockchain are slower in terms of processing the transactions in comparison to conventional databases, owing to the fact that these need to be validated on different servers. Moreover, permissionless blockchains with a higher volume of transactions in the supply chain are significantly costlier because of the transactional amount required to be paid for creating the blocks. Hence, the process in which blockchain technology needs to be implemented requires a major emphasis on scalability issues and a strategizing of their models accordingly (Wegrzyn, 2021).

In addition to this, several organizations lack proper information related to the implementation and usage of blockchain, which restrains the business from strategizing their adoption plans (Geroni, 2021).

Competitive landscape

The growing incorporation of blockchain technology is expected to completely revolutionize supply chain businesses as they place emphasis on rethinking economies, ecosystems, and enterprises. With increasing technological innovations among the players, competition is expected to intensify in various segments. The leading vendors emphasize the identification of various market prospects and setting up of goals to attain efficient usage of capital resources. One of the key strategies incorporated by the market players is the introduction of differentiated products and solutions, catering to the changing market needs and scenarios. Blockchain for supply chain solutions is therefore expected to pave the way for market leaders in terms of building resiliency and handling disruptions in the future. The blockchain solutions offered by two key market players, IBM and Microsoft, are detailed below.

IBM

Different market players such as IBM are engaged in developing universal supply chain ecosystems and their allies. The IBM blockchain technology enables its partners to share trusted information *via* permissioned blockchain solutions. This can be attributed to the increasing demand for product authenticity across businesses, with better visibility and responsible sourcing to eliminate disputes. There are numerous benefits offered by the inclusion of these solutions, which are discussed below.

The different industries catered upon include:

Food industry

With the unparalleled emphasis on efficiency and security, it is becoming essential for businesses to incorporate several measures that transform the entire supply chain into a smarter process. Companies such as IBM are increasingly engaged in the launch of solutions that cater to the changing competitive scenario.

Solution

Trade lens: TradeLens proposes a holistic overview of the relevant shipment documents, thereby enabling the sharing of correct information across the supply chain processes. This source of information is shared *via* the permissioned supply chain associates for continual growth. This technology has immense potential, as it enables the efficient digitization of documentation handling across the supply chain processes. It offers the freight forwarders and shippers access to documentation and multi-carrier visibility processes *via* a single platform, thereby giving the contributors an updated picture of the trade flow. In addition to this, the platform enables the network participants to seamlessly connect the supply chain associates to the digital platform, hence allowing the documents to be published quickly among permissioned parties (IBM, Hapag-Lloyd and Ocean Network Express Complete TradeLens Integration, Join Rapidly Expanding Shipping Ecosystem to Further Enhance Trade Digitization, 2021). Furthermore, the technology offers enhanced efficiency, speed, accuracy, and transparency in the supply chain processes, thereby optimizing the overall costs as well. The benefits offered by the incorporation of these solutions are:

- a. An innovative platform: The TradeLens platform endorses the drive for interoperability along with the usage of standards. It also supports an application marketplace, thereby welcoming third-party expansion as well.
- b. Single connected ecosystem: With the inclusion of technologies such as TradeLens, the process of data collaboration and sharing becomes easier and more secure.
- c. Sharing of information: Getting real-time accessibility to the relevant supply chain data, such as cargo-related information, key shipping dates, filings of customs, sensor readings, and trade documents, for all the involved parties.

Shipping industry

The reliability of the information in terms of actual and estimated milestones is at times difficult to come by, and not having the right documents in the hands of the correct participant can cause a shipment to stop. With unparalleled proficiency in blockchain technology, workflow automation, and data exchange services, the shipping industry is expected to witness a revolutionary change.

Solution

Food Trust is one of the solutions offered by IBM, which connects the participants *via* a permanent and permissioned record of the system. It focuses on revolutionizing the supply chain process in terms of brand trust, efficiency, sustainability, fraud, security, wastage, and freshness. This can be detailed as:

Supply chain efficiency: Inefficiency in the food system is one of the significant issues that is prevalent across the world. Such issues are expected to negatively impact the wastage of food, carbon footprint, freshness, and consumer pricing. According to the United Nations, supply chain inefficiencies account for nearly 1.4 billion tons of waste of food (Walmart, 2018). With the incorporation of blockchain technology in the food supply chain, the process enables market players to collaborate with each other to increase operational efficiency and effectiveness.

The figure (IBM, 2020) mentioned below illustrates a digital food supply chain process powered by blockchain, which enables businesses to adapt to the change and compete in today's competitive scenario (Figure 1).

Brand trust: At present, consumers are being offered several options. Brand differentiation plays a crucial role in influencing consumer purchase decisions, with sustainability being one of the key options. In addition to this, the other factors included are moving beyond compliance, quality of food products, freshness, and safety. The solution offered by the company generates a permissioned, shared, and secured record of transactions, thereby creating an unparalleled visibility at every step of the process.

Food safety: The inclusion of blockchain in the food supply chain process enables the network participants to have improved access to data and the enhanced safety of the food products. The records are stored in an immutable and decentralized manner, thereby increasing overall productivity. A few benefits offered by the technology in terms of food safety include end-to-end traceability, food confidence, and transparency.

The solutions offered by IBM comprise various modules to help the participants in the food system to merge and collaborate and accordingly strategize their offerings. The trace module—the document module along with the IoT and blockchain technology—offers the process unparalleled security within seconds.

Food fraud: In today's scenario, food fraud and adulteration continue to increase across the globe. Increases in pricing, a historical lack of testing for the adulterant, the complexity of the supply chain, the lack of regulatory enforcement, and analytical testing of the complaints are a few of the factors expected to contribute to the rising fraud in food products. Blockchain technology helps to uncover and eliminate the possibilities of error and fraud.

Microsoft

The innovative blockchain technologies developed by Microsoft help to financialize and digitize core inventory assets, thereby helping to attain unique traceability solutions. The Microsoft Cloud is a platform comprising solutions that empower businesses to succeed in the changing competitive world. New efficiencies can be gained by Dynamics 365, Microsoft Security, Microsoft 365, Azure, and Industry Solutions. The blockchain technology platform by Microsoft helps to generate accountability, transparency, and trust

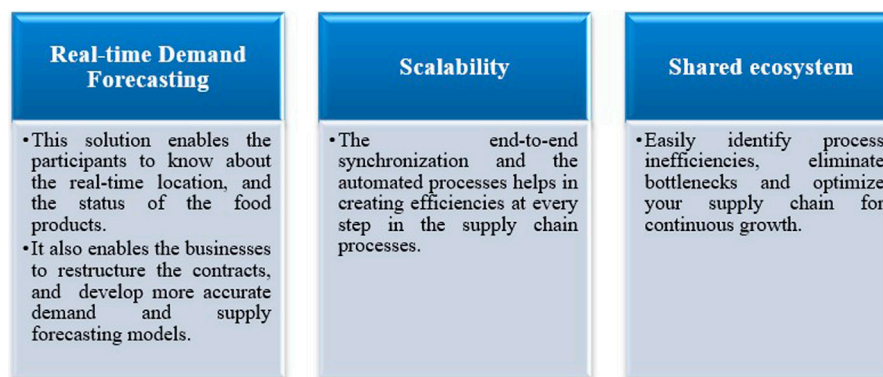


FIGURE 1

Food supply chain process powered by blockchain. Source: (IBM, 7 Benefits of IBM Food Trust).

between the supply chain parties. This technology enables the participants to seamlessly track the status of an asset when it moves across a custodial chain by sharing information about the way it is being handled and its origination

The Microsoft Cloud supply chain process helps to deliver a capacity that is predictable and at scale to allow the clients to attain more. The company offers solutions by offering an innovative digital transformation in the supply chain processes, upgrades, and synchronized processes across all parties. The Azure cloud platform by Microsoft offers services for building fully integrated solutions for the needs and requirements of Industry 4.0, comprising managed blockchain services and IoT platforms (Tempesta, 2019).

Conclusion

A supply chain is a complicated network, with the inclusion of several stakeholders, investors, and components. Several initiatives have led to a centralized approach to enhance the standardization and integration of the siloed ordering into the logistics. Securing the global supply chain with effortless functioning is essential for the economic prosperity and national security of any developed country (U.S. Department of Homeland Security, 2021). In today's scenario, blockchain technology has immense potential to revolutionize supply chain processes across different industries. This network ledger keeps a record of manufacturing updates by use of a serial number and acts as a tamper-proof source of reality, thereby eliminating the prospects for nefarious players.

This technology is expected to deliver a collaborative, transparent, and efficient network for businesses to share information securely and quickly across supply chain processes in different sectors (Zhang, May 2019). Major factors bolstering the incorporation of blockchain in supply chain processes can be attributed to its increasing popularity in the manufacturing and retail sector. In addition to this, the shifting preferences of businesses towards agile and leaner supply chains with end-to-end visibility also favorably impact the increasing adoption of blockchain-enabled solutions.

The availability of the latest standards and regulations for representing and governing the transactions on a block, along

with new permissioned blockchains, is expected to impact the adoption of this technology. Due to the different assurances offered by blockchain solutions in transparency, immutability, fault tolerance, and security, several real use cases are being worked upon in the supply chain processes. However, there are a few non-technical and technical challenges that need to be addressed for the seamless and efficient operational activities of a business. Hence, for businesses ready to cater to the fluctuating scenario of supply chain management in networking, the incorporation of blockchain technology leads to enhanced efficiency and the optimization of costs, with a robust hold in the global marketplace.

The key emphasis of this study is to provide a brief analysis of the significance of blockchain technology in supply chains. It contemplates the different technology-enabled real use cases and the factors propelling and restraining the adoption of blockchain in supply chain processes. Nevertheless, the forthcoming work must address the different technical issues related to blockchains such as interoperability, scalability, security, and throughput. In addition to this, the upcoming areas of research include the applicability of blockchain in insurance, medical, and logistics supply chain segments.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

The author confirms being the sole contributor of this work and has approved it for publication.

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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