

Blockchain in Supply Chain: A Tailored Implementation Model for Golrang Industrial Group

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Abstract

This study aims to establish a comprehensive framework for integrating blockchain technology into the supply chain of Golrang Industrial Group. Adopting a qualitative methodology with a practical orientation, the research utilizes Strauss and Corbin's paradigm model for data-based theoretical exploration. The study's statistical population includes food industry factories affiliated with Golrang Industrial Group, with data collected through interviews with ten purposefully selected experts from the food industry and academia. Grounded analysis involving open, central, and selective coding was employed, resulting in a model comprising 54 indicators categorized into 19 concepts. The findings reveal that causal conditions include strategy design, goal setting, blockchain structure development, fostering inter-company cooperation, and financial and economic infrastructure provision. Key transformative factors involve industrial innovation, the Internet of Things, and artificial intelligence. Essential facilitators include employee training, continuous data updates, and skill-focused blockchain selection processes. Background conditions such as transformational leadership, standardization, legal frameworks, and scaling procedures are critical for optimization. These findings provide valuable insights into the potential benefits and challenges of blockchain integration in Golrang Industrial Group's supply chain, offering practical guidance for similar endeavors in the industry.

Keywords: Technology, Block Chain, Supply Chain, Grounded Theory.

1- Introduction

The supply chain involves various entities, information, and activities that coordinate planning, monitoring, engineering, and inventory management from the beginning to the end of the consumption process (Attar et al., 2016; Soufi et al., 2023). Its primary aim is to create a trustworthy environment among stakeholders, ensuring efficient communication, cost savings, system security, and transparency (Tavakol et al., 2023a, 2023b; Soltanifar et al., 2021). Blockchain technology enhances supply chain operations by facilitating data sharing among network members (Ghode et al., 2020). However, as

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supply chains grow in scale and complexity, they become more susceptible to disruptions due to factors like globalization and outsourcing (Shashi et al., 2020). These challenges, including increased customization, inventory reduction, and global competition, can negatively impact cost control and information flow (Ahmed & Omar, 2019). Disruptions such as power outages or system failures can trigger cascading issues, leading to critical situations like service interruptions, data loss, communication breakdowns, and security risks (Abbasi & Choukolaei, 2023).

It is essential for supply chains to incorporate creative methods to promptly and cost-effectively respond to the constantly shifting market dynamics, which are progressively growing in both scale and diversity (Homayounfar et al., 2018a,b). Therefore, organizations on a global scale are moving away from traditional supply chain management systems and embracing technology-driven alternatives to foster improved and efficient collaboration between suppliers and buyers (Yousefi et al., 2020). Over the past few years, blockchain technology has been increasingly adopted by numerous supply chain management systems, with the primary objective of enhancing operational efficiency (Pilkington, 2016).

The concept of blockchain is derived from its name, as it represents a series of interconnected blocks. Each block is composed of a head and a body, following a consistent structure. Notably, every block includes a precise reference to the preceding block, thereby creating a continuous chain. The one and only exemption is the Genesis block, which serves as the initial block in the blockchain established by a software. Following this block, all transactions are consolidated and saved in the subsequent block through a procedure known as mining (Kim and Shin, 2019). In recent years, the significance and recognition of blockchain technology have grown considerably. Nevertheless, there remains a scarcity of empirical studies focusing on the precise organizational and technological factors that significantly influence its implementation within the supply chain (Maher and Kumar, 2022). According to what has been mentioned, the main question of this research is that what is the implementation pattern of block chain technology in the supply chain of Golrang Industrial Group? With respect to this matter, the research has thoroughly investigated the theoretical framework and research methodology, followed by an exposition of the findings. Ultimately, a detailed discussion and conclusive statements have been articulated.

2- Literature Review

In 2008, during the global economic crisis triggered by the collapse of the speculative bubble in the U.S. real estate market, Satoshi Nakamoto introduced Bitcoin through a comprehensive white paper. Bitcoin operates on a decentralized structure through blockchain technology, setting it apart from conventional payment platforms like PayPal. While Bitcoin shares some user functionalities with PayPal, its reliance on a decentralized public blockchain ensures resilience against attacks. This network, distributed across multiple devices worldwide, is highly resistant to tampering and has demonstrated consistent reliability and stability since its launch in 2009 (Berneis et al., 2021). Fundamentally, blockchain serves as a secure distributed database system, leveraging encryption and robust management mechanisms to store transaction data (Swan, 2015; Nozari & Aliahmadi, 2022).

Blockchain technology is particularly impactful in the context of businesses, where it addresses challenges related to transparency and accountability among parties with differing interests. By allowing real-time updates of shared critical data, blockchain eliminates error-prone and labor-intensive procedures associated with internal data management (Casey and Wong, 2017). It allows transactions to be decentralized, removing the need for a single server and enabling processing across the entire network. Using cryptographic techniques, transactions are verified, and data replication ensures data integrity. The interconnected nature of blockchain systems means any alteration in one block propagates to all related blocks, further strengthening security and reducing risks of manipulation (Bahadoran et al., 2022).

In the era of digital transformation, technologies such as blockchain, Internet of Things (IoT), and cloud computing have revolutionized the scope of applications, enabling individuals and organizations to unlock new opportunities (Abou-Nassar et al., 2020). However, this digital shift has also led to increasing complexity in supply chains (Homayounfar and Amirteimoori, 2019; Nozari & Szmelter-Jarosz, 2022). The expansion of businesses has resulted in larger-scale operations, more diverse product portfolios, changing customer preferences, unpredictable demands, and a necessity to collaborate with

numerous suppliers across different regions (Soltanifar et al., 2022). The involvement of multiple intermediaries and geographically dispersed service locations further complicates supply chains (Kamble et al., 2018; Nozari et al., 2024).

Blockchain technology addresses these challenges by enhancing the traceability and transparency of products throughout the supply chain. It allows the tracking of a product's journey from raw material suppliers to the final consumer, thus ensuring authenticity and minimizing counterfeit goods (Mackey and Nayyar, 2017; Kshetri, 2017). By reducing the number of people involved in data entry and making information accessible to all stakeholders, blockchain minimizes errors and eliminates redundant tasks. This streamlining of processes facilitates precise demand forecasting, disruption management, and reduction of inventory holding costs (Verhoeven et al., 2018; Ivanov and Sokolov, 2018).

Despite these benefits, blockchain adoption faces notable obstacles. The lack of a clear legislative and regulatory framework surrounding blockchain remains a significant barrier to its widespread adoption. As a relatively new technology, its implementation requires extensive time and research. Any misuse or improper utilization can pose challenges to governance and stability, further complicating its adoption (Nguyen, 2016; Movahed et al., 2024).

Blockchain technology, in combination with IoT and artificial intelligence (AI), has the potential to transform supply chain operations further. These technologies enable real-time tracking of goods and passengers across the supply chain, providing unparalleled visibility and control. Blockchain facilitates the synchronization of data across all participants, ensuring that all actions within the supply chain are visible to stakeholders. This capability not only optimizes operations but also addresses key challenges, such as identity management, transparency, and operational inefficiencies (Di Vaio and Varriale, 2019). The implementation of blockchain can also significantly enhance the sustainability, visibility, and integration of supply chains. By fostering better integration among supply chain partners, it improves the overall traceability and efficiency of the supply chain, addressing the inherent complexities of global operations. These complexities often stem from the multilayered and geographically widespread nature of modern supply chains (Ali et al., 2021; Mubarak et al., 2019). Blockchain's ability to maintain a single source of truth for all participants ensures consistent, reliable data, facilitating better decision-making and collaboration across the network (Casado-Vara et al., 2018; Salahi et al., 2021).

While the potential benefits of blockchain in the supply chain are significant, its adoption requires careful consideration of its limitations and challenges. Research and strategic planning are essential to overcome barriers and maximize the technology's potential to revolutionize supply chain management. Several studies have been conducted in the realm of supply chain and blockchain, which can be cited in relation to this matter. Trust Chain was presented by Jayashri et al. (2023) introduced the "Enhanced Blockchain System for Integrated Supply Chain in IoT with Enhanced Security," emphasizing a three-layer structure that calculates trust and reputation scores among supply chain actors via IoT consortium blockchain. The system uniquely supports product-specific reputation ratings for supply chain participants, achieved through smart contracts that calculate ratings transparently, securely, and automatically.

Irfan Khan et al. (2023) explored the impact of blockchain technology on supply chain management, highlighting benefits like faster, cost-effective product delivery, improved traceability, and enhanced coordination. By granting all participants identical access to information, the technology minimizes communication errors, reducing time spent on data validation while improving product quality and lowering expenses. Susheelamma et al. (2023) examined blockchain's potential to revolutionize SCM beyond digital currencies. They identified its ability to enhance efficiency by minimizing errors, reducing delays, and fostering secure, transparent environments. This leads to better management practices and builds trust between suppliers and consumers.

Srivastava and Dashora (2022) focused on blockchain in agricultural supply chains, analyzing 89 studies to underscore its importance in food safety, traceability, transparency, disintermediation, and integration with the agricultural IoT. Al Yassin et al. (2023) demonstrated that blockchain investments significantly enhance supply chain competitiveness and efficiency. Ranjbar Malekshah et al. (2022) investigated blockchain in vegetable oil SCM, finding that it improved order execution, supplier communication, transaction transparency, and data immutability. Golzar and Pilehvari (2021) proposed a fuzzy inference model to assess blockchain's impact on automotive SCM. Their model considered criteria like feasibility, strengths, and weaknesses, showing its potential for improved supply chain performance. Table 1 summarizes some of the recent studies.

Table 1. Recent studies on Blockchain

Study	Focus Area	Key Findings
Jayashri et al. (2023)	IoT & Reputation in SCM	Introduced "Trust Chain" using IoT consortium blockchain and smart contracts for reputation-based trust and transparency.
Irfan Khan et al. (2023)	Blockchain & Inventory Management	Improved traceability, cost efficiency, communication, and coordination; reduced validation errors.
Susheelamma et al. (2023)	Blockchain in General SCM	Reduced fraud, delays, and inefficiencies; enhanced transparency, trust, and overall SCM practices.
Srivastava & Dashora (2022)	Blockchain in Agricultural SCM	Enhanced food safety, traceability, disintermediation, and transparency in agricultural IoT systems.
Al Yassin et al. (2023)	Blockchain Investment in SCM	Boosted competitive edge and efficiency in supply chain enterprises.
Ranjbar Malekshah et al. (2022)	Vegetable Oil SCM	Improved order execution, supplier collaboration, data immutability, and transaction transparency.
Golzar & Pilehvari (2021)	Blockchain in Automotive SCM	Proposed a model using fuzzy inference systems to analyze blockchain's feasibility, strengths, and potential weaknesses in automotive supply chains.

This study contributes to the body of knowledge by presenting a comprehensive, data-driven framework tailored specifically for the integration of blockchain technology within the supply chain of Golrang Industrial Group, a major player in the food industry. Using Strauss and Corbin's paradigm model, the research provides a nuanced qualitative analysis, identifying 54 indicators organized into 19 distinct concepts. The study's originality lies in its holistic examination of causal, transformational, and facilitating factors, alongside critical background conditions and actionable strategies, to optimize blockchain implementation. Unlike prior research, it incorporates a multidimensional approach, including industrial innovation, the Internet of Things, artificial intelligence, and transformational leadership, to address the unique complexities of the food supply chain. The proposed framework not only enhances supply chain transparency, security, and cost-efficiency but also bridges practical and theoretical gaps, offering scalable insights for blockchain adoption in similar industrial contexts.

3- Material and Methods

The current research employed a qualitative strategy and adopted the Grounded Theory method. Grounded Theory methodology focuses on uncovering behavioral patterns rooted in everyday experiences, providing valuable insights into research methodologies and guiding future research endeavors. The complexities associated with theoretical frameworks in literature and the evolving data collection techniques call for further investigation (Markey et al., 2020). Strauss and Corbin (1990) also highlighted that grounded theory offers insights into human behavior (Crawford et al., 2020). A semi-structured interview method consisting of 6 questions was employed as the tool for gathering information in the current study. This method consisted of 6 thoughtfully designed questions, which were developed after a comprehensive analysis of the relevant literature. The formulation of these questions was done under the close supervision and guidance of supervisors and advisors. These questions were then utilized during the interview sessions. The information for the present study was collected through open interviews held either in person or over the phone with a statistical population of 10 individuals. This group included food industry experts, specialists, university professors, and other specialists who were purposefully selected.

The analysis process encompasses three types of coding: open coding, axial coding, and selective coding. Open coding involves the identification of concepts and the discovery of their properties and dimensions within the data. In the second stage, occurrences, events, and happenings are analyzed as potential indicators of the phenomenon (open codes) and are given a conceptual label. The third stage focuses on the creation of categories, which are more abstract and exhibit a higher level of abstraction compared to concepts. Through the analytical process of making comparisons, these categories are generated to highlight both similarities and differences. These categories are then utilized at a lower level to generate concepts, serving as the essential platforms for constructing theories. Axial coding, on

the other hand, involves the process of associating categories with their subcategories and linking them along the "axis" of features and dimensions. According to the systematic method developed by Strauss and Kurien (1998), the various categories obtained from the initial data are compiled into a structure known as axial coding. In accordance with Strauss and Corbin's (1998) paradigm model, the present research is structured into the following steps: 1-Formulating research questions, 2-Collecting data, 3-Coding data in three stages, 4-Writing analytical notes: recording thoughts and own interpretation of data, 5-Writing and compiling theory.

The study included a total of 10 participants, consisting of 7 men and 3 women. Furthermore, the table 2 illustrates that out of these participants, 4 individuals held a doctorate degree while 6 individuals possessed a master's degree.

Table 2. Demographic description of research samples

GROUP	Number	Average age (years)	Average work experience (years)	Education	
				Master's degree	P.H.D
Golrang Industrial Group food industry managers	3	52.33	25	66.67 %	33.33
Golrang Industrial Group food industry experts	3	41.66	14.33	100%	-
Supply chain management specialists	2	46.5	19.5	50%	50%
University professors and experts	2	56	23.5	-	100%

All interviews have been recorded and the audio file has been thoroughly processed. Theoretical saturation was achieved during the eighth interview, nevertheless, interviews were conducted until the tenth sample to ensure the sufficiency of data. To obtain the desired information, the research focused on enriching the interviews. Sample analysis was conducted incrementally after each interview. Written transcripts were generated post-interview, and further key topics and categories were identified during the conceptualization process.

4- Results

Open coding

The process of open coding comprises three essential phases. Firstly, key points or excerpts of text are coded. In the second phase, open codes that differ in appearance but share a common concept are placed side by side to generate concepts. Lastly, the third phase involves the creation of categories (Strauss and Corbin, 1998). Due to the length of the interview text, Table 3 shows a sample of texts and initial codes extracted from the interviews.

Table 3. An example of the conceptualization of verbal evidence

Verbal evidence	Open coding
Supply chain protocols generally encompass regulations and norms for engaging with other members of the supply chain.	Agreement and cooperation with supply chain partners
The functioning of blockchain is intricately tied to its specific data structure. It is essential to choose a technology that is compatible with the blockchain's data structure, enabling the seamless storage and transfer of information through interconnected blocks and chains, ensuring the accuracy and verifiability of the data. The Internet of Things (IoT) enables employees to collect and share supply chain-related data using connected devices.	Compliance with data structure Development of the use of the Internet of Things
It is crucial for organizations to train their employees on the challenges and limitations associated with new technologies such as blockchain. This will enable them to anticipate potential obstacles early on in the implementation phase and devise suitable strategies to tackle them.	Awareness of challenges and limitations
By utilizing strong cryptography in transactions and digital signatures, blockchain technology ensures the security of data. Encrypted information stored within the blocks is protected, and any unauthorized changes or transfers are promptly detected by the blockchain network.	Strengthen security and data protection
The security of data is safeguarded by blockchain technology, which employs powerful cryptography in transactions and digital signatures. Encrypted data within the blocks remains secure, with any unauthorized modifications or transfers being flagged by the blockchain network.	Using the right data coding system
Utilizing effective design patterns in the implementation of blockchain technology can greatly enhance its speed and efficiency.	Increasing the speed and efficiency in exploiting the block chain

The next phase of open coding involves the presentation of tables that exhibit the concepts derived from secondary codes and the categories derived from these concepts. After gathering data and conducting interviews, this study has identified 19 components and 54 indicators, which are organized in a specific manner.

Causal conditions: The current research focuses on identifying the causal conditions that include strategy design and goal setting, block chain structure design, fostering inter-company cooperation and homogeneity, and establishing the necessary financial and economic infrastructures. These conditions are outlined in Table 4.

Table 4. Classification and organization of causal conditions

Category	Component	Indicator
Causal conditions	Strategy design and goal setting	Analyzing the company's environment and needs, providing suitable strategies for the implementation of block chain technology, monitoring and measuring the implemented model.
	Block chain structure design	Choosing the right blockchain, determining the scope and scope of the blockchain, choosing the right technology along with the blockchain
	Development of inter-company cooperation and coordination	Developing transparency and trust between supply chain members, creating shared interests, creating common standards and rules between companies
	Providing appropriate financial and economic infrastructure	Creating systematic changes in the financial system, creating an acceptable technological business model, defining a dedicated budget line

The necessary causal conditions for the implementation and implementation of block chain technology in the supply chain of Golrang Industrial Group are:

Strategy design and goal setting: This process encompasses the examination of the organization's environment and requirements, formulating suitable approaches for the integration of blockchain technology, and establishing systems to oversee and evaluate the implementation framework.

Blockchain structure design: Key aspects of this process involve selecting the correct blockchain, establishing the extent and limitations of the blockchain, and choosing the appropriate technology to support the blockchain solution.

Development of inter-company cooperation and coordination: This process entails cultivating transparency and trust among supply chain stakeholders, fostering mutual interests, and establishing uniform standards and regulations to facilitate cooperation and partnership among firms.

Providing appropriate financial and economic infrastructure: This process includes making systematic changes to the financial system to support blockchain implementation, developing a viable technological business model, and defining dedicated funding lines for blockchain initiatives. The establishment of these causal conditions is imperative in order to establish a solid foundation for the effective integration of blockchain technology within the supply chain of Golrang Industrial Group. Strategic planning, technology considerations, inter-company relationships, and financial infrastructure are all addressed to ensure the seamless integration of blockchain technology. The effective integration of blockchain technology into Golrang Industrial Group's supply chain necessitates a specialized team equipped with the essential skills to oversee the process. This includes managing risks and guaranteeing the seamless functionality of the blockchain solution. Furthermore, it is essential to implement continuous education and training initiatives to ensure that employees stay updated on the most recent advancements in blockchain technology and its utilization in the supply chain. This fosters an environment of innovation and ongoing enhancement within the company, guaranteeing the sustained success of blockchain integration.

Contextual conditions: The contextual conditions outlined in Table 5 for this study encompass utilizing a transformational leadership approach, establishing norms and legal frameworks, and implementing a scaling method within the organization.

Table 5. Classification and organization of background conditions

category	component	Indicator
Contextual conditions	Using a transformational leadership style	Development of transformational leadership and appropriate organizational commitment, appropriate management of knowledge, use of successfully implemented models
	Providing standards and legal settings	Providing data protection laws and regulations, providing security standards, providing standards related to inter-company information sharing
	Development of scaling procedure in the company	Development of chain technology sustainability, creating a suitable technological networking between supply chain members, providing flexible technological architecture

The necessary conditions for the implementation and implementation of block chain technology in the supply chain of Golrang Industrial Group are:

Using a transformational leadership style: This process entails the development of transformational leadership and the cultivation of suitable organizational commitment, while also implementing knowledge management practices and leveraging successful models for blockchain implementation.

Providing standards and legal settings: This encompasses enforcing data protection laws, implementing security protocols, and defining criteria for intercompany information exchange to meet legal and regulatory standards.

Development of scaling procedures in the company: This consists of improving the sustainability of blockchain technology, establishing a suitable technology network among supply chain members, and offering a flexible technology architecture to support the scalability of blockchain solutions. The necessary contextual conditions are fundamental for creating a conducive setting within Golrang Industrial Group to facilitate the successful implementation of blockchain technology in its supply chain. These conditions encompass leadership, regulatory compliance, and scalability considerations to promote the effective integration of blockchain technology.

Intervention conditions: The present study highlights the intervening conditions as involving the provision of necessary training to employees, the continuous updating of company information and

data, and the establishment of skill-oriented procedures in block chain selection, as delineated in Table 6.

Table 6. Classification and organization of intervening conditions

Category	Component	Indicator
Intervening conditions	Providing necessary training to employees	Developing awareness of blockchain technology, developing employees' familiarity with technologies related to blockchain, conducting case studies and practical tests in the form of a pilot.
	Updating company information and data	Providing technological policies and procedures in the dissemination of information, using new methods in collecting and communicating employee opinions about blockchain technology.
	Development of skill-based procedures in block chain selection	Coordination of blockchain technology with supply chain protocols, development of technological capabilities of the company

Providing necessary training to employees: This procedure involves enhancing the knowledge of the staff regarding blockchain technology, acquainting them with technologies associated with blockchain, and carrying out case studies and practical experiments to test the technology.

Updating company information and data: To successfully implement this, it is essential to develop technology policies and procedures for the dissemination of information. Additionally, innovative approaches must be employed to gather and convey employee feedback on blockchain technology.

Development of skill-based procedures in blockchain selection: It involves integrating blockchain technology with supply chain procedures and concentrating on enhancing the company's technological capacities to guarantee that the selected blockchain is in line with particular supply chain requirements and protocols. Typically, these intervention requirements are essential for the preparation of Golrang Industrial Group's organization, its employees, and its technological infrastructure to effectively incorporate blockchain technology into their supply chain operations. Enhancing transparency, traceability, and efficiency within the supply chain is crucial. Golrang Industrial Group can solidify its position as a pioneer in leveraging blockchain technology by focusing on employee training, updating information systems, and aligning technology with supply chain protocols. This strategic approach will guarantee a seamless and effective implementation process.

Strategic conditions: In the present study, the tactics encompass effective administration of identity and access, utilization of suitable security measures and data encryption techniques, and prioritization of secure data and information transmission, as outlined in Table 7.

Table 7. Classification and organization of strategic conditions

Category	Component	Indicator
Strategy	Appropriate management of identity and access	Accurate and unique identification for different corporate entities, use of appropriate authentication system, development of proofs and approvals methods.
	Using appropriate data security and encryption methods	Use of appropriate cryptographic algorithm, proper management of cryptographic keys, use of appropriate digital signature mechanisms
	Emphasis on the safe transfer of data and information	Using the right system for data coding, developing information network security, providing physical block chain security guarantees

In this part, different strategies were introduced to guarantee the safety and reliability of data and information during the adoption and execution of blockchain technology within Golrang Industrial Group's supply chain. These strategies include:

Proper management of identity and access: This involves the meticulous verification of precise and exclusive identification for numerous corporate entities. This can be accomplished by employing

appropriate authentication systems and formulating methodologies to facilitate the provision of documentation and approvals.

Using appropriate security and data encryption methods: This strategy highlights the importance of implementing suitable encryption algorithms, managing encryption keys effectively, and utilizing appropriate digital signature mechanisms to secure data.

Emphasizing on safe transfer of data and information: The utilization of suitable encryption systems, enhancement of network security, and provision of physical security guarantees are all vital in securing blockchain data. These strategies are specifically designed to tackle crucial elements of data security, such as identity management, encryption, and secure data transmission. The primary objective is to ensure the protection and reliability of companies' data and information. Therefore, it is imperative for companies to prioritize these strategies. By putting these measures into practice, organizations can effectively reduce the likelihood of data breaches and unauthorized access. This will help establish a secure framework for safeguarding sensitive information and maintaining stakeholder trust. Furthermore, compliance with security protocols ensures adherence to regulations and industry standards, ultimately enhancing overall business flexibility and competitiveness.

Core category: The core requirements identified in Table 7 for this investigation involve the factors associated with industrial revolution, as well as the enhancement of Internet of Things and artificial intelligence implementation within the corporation. In the table 8, the central category related to the research is stated:

Table 8. Classification and organization of the core category

Category	Component	Indicator
Core category	Industrial-oriented transformation	Supplying skilled human resources, appropriate technological changes in the company structure, providing suitable mechanisms for solving inter-company disputes
	Development of the use of Internet of Things and artificial intelligence in the company	Paying attention to employee innovation in the field of Internet of Things and artificial intelligence, developing cooperation with knowledge-based companies

Within the core category, it pertains to the fundamental components required for the industrial evolution within a corporation. This encompasses the provision of skilled manpower, implementation of appropriate technological advancements in the company's setup, and establishment of procedures to resolve inter-company conflicts. Furthermore, the primary focus is on the development and utilization of the Internet of Things (IoT) and Artificial Intelligence (AI) in the corporate sector. This involves fostering innovation among employees in the domains of IoT and AI, as well as enhancing collaboration with knowledge-based companies specializing in these particular fields. The core category consists of the key elements required to steer industrial evolution, encompassing human resources, technological advancements, conflict resolution, and the strategic advancement of IoT and AI capabilities. It is essential to effectively implement these fundamental components in order to secure a competitive edge for the company within a swiftly changing industry environment. Through focusing on enhancing the capabilities of the workforce and embracing technological progress, the company can enhance its operational efficiency and flexibility. Furthermore, implementing efficient conflict resolution strategies promotes a cohesive workplace atmosphere and streamlines decision-making and teamwork. Adopting IoT and AI technologies propels the company to the forefront of innovation, empowering it to leverage

new opportunities and stay ahead of industry trends. In general, the complete integration of these key elements is crucial for fostering a sustainable industrial transformation and securing enduring success.

Implications: In conclusion, there are implications that illustrate the results derived from the execution of plans. This study has organized the findings into various categories: the impacts of enhancing production and trade security, the effects of promoting corporate transparency, the outcomes of enhancing product tracking and tracing, and the consequences of reducing transfer costs. These categories are detailed in Table 9.

Table 9. Classification and organization of implications

Category	Component	Indicator
Implications	Improving the security of production and trade	Proof of authenticity and falsifiability, proof of transactions, development of transfer information security
	Development of corporate transparency	Transparency in financial transactions, transparency in business activities, transparency in monitoring and inspection processes
	Improved tracking and tracking of company products	Accurate tracking of products, proof of identity and prevention of fraud, increasing trust capabilities
	Reduce transportation and maintenance costs	Reducing costs related to product failures and errors, eliminating intermediaries and reducing executive actions, reducing security costs for product preservation

The incorporation and operation of blockchain technology in Golrang Industrial Group's supply chain yields noteworthy outcomes which includes improving the security of production and trade (proving authenticity and falsifiability, proving transactions, developing the security of transfer information), developing corporate transparency (transparency in financial transactions, transparency in business activities, transparency in monitoring and inspection processes), Improving tracking and tracing of the company's products (accurate product tracking, identity proof and fraud prevention, increasing trust capabilities), Reduction of transportation and maintenance costs (reduction of costs related to product failures and errors, elimination of intermediaries and reduction of enforcement actions, reduction of security costs of product preservation). Moreover, this technology facilitates direct engagement between producers and consumers, thereby bolstering public faith in the company's products and services. In addition, the utilization of blockchain technology leads to the augmentation of efficiency and rapidity in carrying out transactions and business procedures. Furthermore, it can contribute to the enhancement of the decision-making process and the optimization of the company's resources. On the whole, the implementation of blockchain technology in Golrang Industrial Group's supply chain brings about significant enhancements in the company's performance and operational effectiveness. In conclusion, the adoption of blockchain technology in Golrang Industrial Group's supply chain has the ability to improve various aspects of the supply chain, including security, transparency, traceability, and cost-effectiveness. This has the potential to create a more streamlined and dependable supply chain ecosystem.

Selective coding

The final phase in the grounded theory method is known as the selective coding stage. This phase involves selecting the main category, establishing systematic connections between this main category and other categories, validating these connections, and refining and developing categories that require additional attention. Taking into account the preliminary studies, opinions of the interviewed individuals, and the analysis of data collected using the foundational data theory method, the present research establishes a proposed model. This model is derived by calculating the main concepts and is depicted in Figure 1.

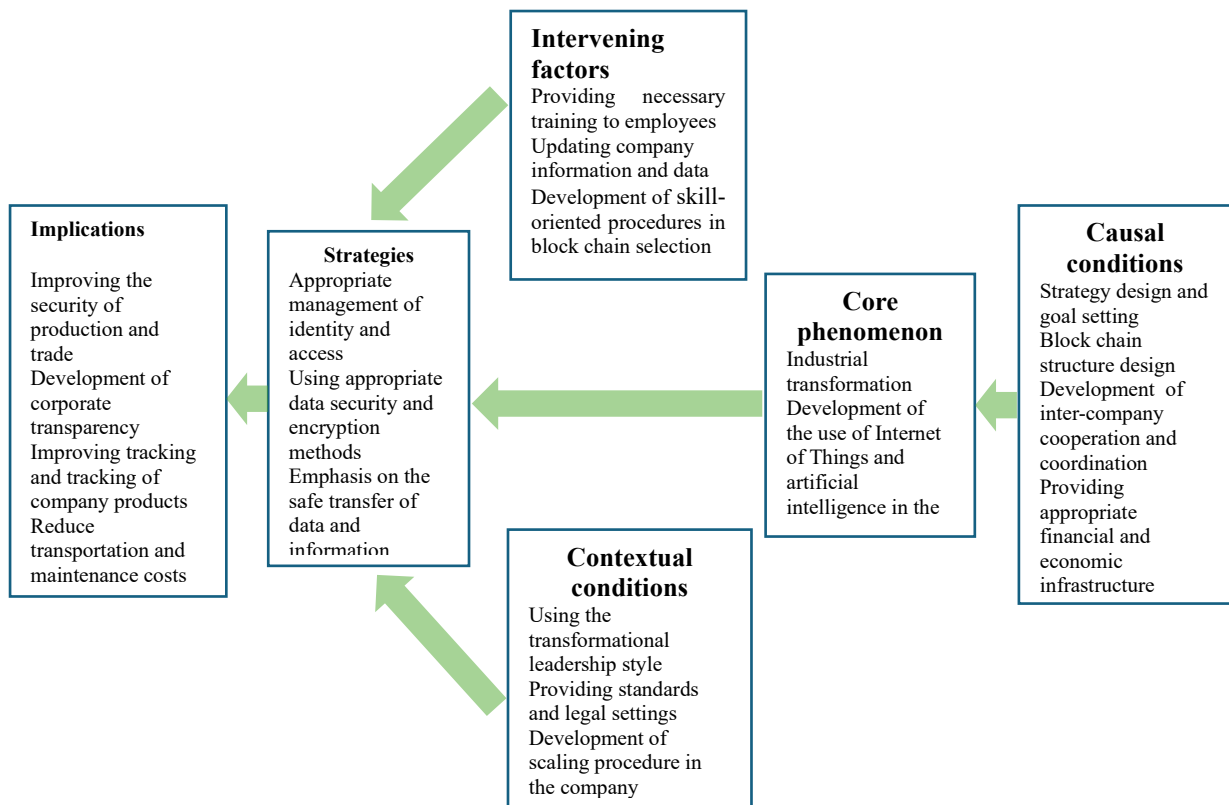


Figure 1. Conceptual model

5- Conclusion

Over the past few years, the utilization of blockchain technology within the supply chain has been a crucial matter. The objective of this research was to devise a blueprint for incorporating blockchain technology into Golrang Industrial Group's supply chain, employing a qualitative research strategy rooted in Strauss and Corbin's paradigm model. Through the utilization of open interviews with ten food industry experts, university professors, and specialists, the foundation successfully gathered and analyzed data using its data analysis method. Following the coding phase, a total of 54 secondary codes were extracted and classified into 19 different concepts. The findings of this investigation highlighted a number of important factors that play a role in the successful incorporation of blockchain technology into the supply chain. Key conditions such as blockchain strategy and structure design, inter-company cooperation, and financial infrastructure were recognized as vital for the implementation of blockchain. Core elements, such as industrial revolution, the utilization of Internet of Things and artificial intelligence, and influencing factors like employee education and skill-focused techniques were underscored. Furthermore, contextual factors like leadership style, legal frameworks, and expansion methods, along with strategies for identity and access management, security, and data encryption are imperative for a successful integration. The findings of this research indicate that the integration of blockchain technology into the supply chain of Golrang Industrial Group has the potential to increase production and trade security, enhance transparency among companies, improve product tracking and tracing capabilities, and reduce transportation and maintenance expenses. The aforementioned findings offer significant perspectives on the potential advantages and obstacles linked to the incorporation of blockchain technology into supply chains, specifically within the food industry. In summary, this study has introduced a comprehensive model for integrating blockchain technology into the supply chain of Golrang Industrial Group, offering valuable insights into the benefits and potential challenges associated with this integration.

The results obtained are in line with the results of previous research, including the research of Jayashri et al. (2023), Susheelamma et al. (2023), Ranjbar Malekshah et al. The conclusions drawn from this research have the potential to provide a solid foundation for further examination and utilization of blockchain technology in supply chain management, not only within Golrang industrial group, but also

in other analogous industries. The findings of this study contribute to the ever-growing body of knowledge on blockchain technology and its applications in supply chain management. Furthermore, it presents a framework for future research and practical implementation. The proposed model offers a comprehensive understanding of the opportunities and challenges associated with integrating blockchain technology and provides organizations with a roadmap to enhance their supply chain operations through its utilization. It is recommended to conduct a comparative study on the integration of blockchain technology in the supply chains of various companies within the food industry. This analysis should encompass an evaluation of the obstacles, advantages, and results associated with the adoption of blockchain in diverse organizational setups and supply chain intricacies. Furthermore, the exploration of the synergies between blockchain technology and other emerging technologies, such as Internet of Things (IoT), artificial intelligence (AI), and big data analytics, in optimizing food supply chain operations and sustainability is being investigated.

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