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Analysis of the Supply Chain in Industrial Companies in Guayaquil, Ecuador – A Secondary Publication

Génesis Belén Linzán Soledispa[1], Betty Janeth Soledispa Cañarte[2], Víctor Alfonso Chávez Soledispa[3], Oscar Rolando Fiallos González[1]*

[1]Universidad Politécnica Salesiana, Guayaquil, Ecuador.
[2]Universidad Estatal del Sur de Manabí, Manabí, Ecuador
[3]Universidad Católica de Santiago de Guayaquil, Guayaquil, Ecuador.

***Corresponding author:** Oscar Rolando Fiallos González, offiallos@ups.edu.ec

Abstract: This research clearly outlines the supply chain in a process of evolution and digital transformation, where the collaboration of its members is concentrated, having technological tools to help chain management. To analyze the advantages that this transformation produces in the supply chain, as well as its different processes, this study has a systemic perspective that involves precise elements for organizational development, such as the different phases of each process, operations, logistics, and distribution. It must be borne in mind that any strategy in industrial companies grants the automation of procedures in the supply chain and determines a product in any phase of production, making the organization more sensitive to any variation in orders. The methodology included a bibliographic and non-experimental review that allows a descriptive and analytical study, which details the various characteristics of the fact that is being investigated, collecting information through interviews with different people who are involved with industrial companies. Among the results obtained, it was identified that digital transformation helps reduce costs and generates greater profitability. In conclusion, it was obtained that the digital supply chain helps in each of the phases of the processes, these are supervised by devices that help to have fast and effective information.

Keywords: Digital transformation; Supply chain; Industries 4.0; Sustainability

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1. Introduction

Currently, connectivity has become one of the fundamental needs for companies, especially industrial ones. Constant technological changes contribute to presenting an opportunity for expansion or a threat if the necessary actions are not incorporated to keep pace with these new challenges [1].

Looking into the future, there should not be a limitation in the business orientation towards technology and business development; on the contrary, there needs to be a shift in the way things are perceived. In logistics,

organizations must perform tasks effectively to continue competing within the market, which has become increasingly complex and demanding over time. Therefore, supply chains must be one step ahead of the operations carried out to remain in the digital age [2].

Digital transformation and the supply chain comprise a succession of interconnected processes, with the customer being the central axis, which is connected to the Internet. The supply chain is no longer a linear process that only focuses on fulfilling customer orders at the end of the operational process. Nowadays, this process is circular, with the consumer positioned at the center of operations [3].

Technology applied in organizations helps maximize the available information so that managers can make decisions based on the existing details within the companies. This strategy can make significant progress in an entity when executing specific actions, such as in the management of the supply chain [4].

This is why incorporating technology into the supply chain becomes an added value to the services and products of an organization. If this tool is not used, the company limits its growth potential due to the complexity of demands, services, and products. Therefore, it is necessary to monitor and readjust operations from processes to delivery to the final customer [5].

Taking risks with new technologies proves to be a good solution for industrial companies in the supply chain process. Digital transformation helps the sector become more productive and profitable, as well as competitive in the global market. This research will analyze the need to consider digital tools that optimize supply chain procedures in industrial companies in Guayaquil.

Furthermore, it must be considered that the digital transformation of supply chains has generated a large amount of data, leading companies to implement strategies that help align the use of this data with their most relevant objectives, conducting complex planning processes, from cloud-based platforms, industrial Internet or Internet of Things (IoT), analysis, big data, customer and supplier networks [6].

Advanced digitalization capabilities can provide opportunities for new functionalities, increased reliability, greater efficiency, and optimization that exponentially increase the value companies deliver to customers. More specifically, it is argued that companies need to develop digitalization capabilities in the form of formalized routines that effectively utilize digital resources to ensure a competitive advantage [7].

Within the processes carried out, data is contextualized to help industrial companies manifest themselves favorably in the changing dynamics of the market. To meet the evolving requirements of the supply chain, integrated business planning must be carried out, synchronizing chain, financial, and commercial plans into a single global administrative process. Thus, digital transformation in the supply chain will provide the industries of Guayaquil with the necessary advantages to improve their growth and business model [8].

The specific objectives of this research work are to: identify the main technological needs in the process of the supply chain of industrial companies, describe the status of the supply chain process in the implementation of digital transformation, and establish the advantages of digital supply chain in the industries of Guayaquil.

In addition to strong leadership, industrial companies need to implement smart innovation in their digital capabilities. Therefore, automating procedures allows decision-making in digital communication channels and knowledge of their benefit. In this sense, it leads companies to evolve into digital education, making companies grow and become more efficient [9].

2. Theoretical foundation

2.1. Digital transformation

Digital transformation is a tool that contributes to solving the difficulties of businesses or industries to provide solutions to the different expectations that customers have. It involves the transformation of an operational

model within organizations to define goals and objectives to be achieved through an innovative process and a systematic review of all departments, including better strategies, technologies, and diverse cultures, offering a more consistent and cross-cutting design [10].

For some years now, there has been debate about the analysis of digital transformation in industries in Guayaquil. It has been discussed in various forums, in meetings of industry bodies, in guilds, and different technical and academic institutions, and the first question about transformation is why digital transformation is wanted. It is clarified that it serves as leverage for a new tool to solve the problems of companies, businesses, and industries, and its contribution to businesses [11].

Implementing this transformation within industrial areas leads to better-digitized performance, focusing on each strategic point that supports this technique as the main opportunity to achieve coherent and systematic processes, resulting in digital growth [12].

According to data provided by the INEC in 2019, companies invested around $281 billion in ICT. Additionally, a study revealed that technology investment continues to rise, with a 0.4% increase in 2019 and a growth of 3.7% for the following year. Technological advances are part of the essential operations of companies that seek to replace mechanical processes with automated ones to provide a better experience for their customers [13].

2.2. Supply chain

In the modern economy, the supply chain is the backbone, although a few years ago, technology generated a perspective on unprecedented utilities when implemented in supply chains [9]. Supply chains consist of a set of tasks that involve a service or product to the provision or delivery to end customers [14].

Within this chain, performance depends not only on one factor but on several, including input suppliers, marketing channels, and organizations, as well as harmonious operation, product flows, frequent information throughout the chain, demanding financial, logistical, and technological providers, as well as public bodies that provide infrastructure and the creation of a functional business environment for better chain management [3].

In the supply chain, there are several actors involved, including:

(1) First and second-level input suppliers: The first supply inputs directly to large organizations. The second level provides raw materials to first-level suppliers, meaning they are considered indirect suppliers to large companies. These are usually larger and belong to various industries such as food, textiles, or automotive. For all these inputs to become a final product, they must go through various transformation processes using raw materials provided by first-level suppliers [15].

(2) Wholesalers or retailers: Companies within the sector that market products to end customers.

(3) Infrastructure operators, transportation companies, and logistics service providers: Companies that assist with the transportation of inputs and final products through various means of transportation, including maritime, land, air, or rail, providing inventory management, storage, and packaging services [15].

2.3. Technological needs in the supply chain process

The concept of a smart supply chain specifically encompasses the entire logistics chain from customer to customer, regardless of location, through effective control of the supplier flow. This control simultaneously concerns cost reduction and quality requirements. To achieve this performance, the smart supply chain exploits intelligent sensors and devices existing in all chain equipment. However, data security against cybercrime and data reliability remain significant issues in integrating smart technologies into the supply chain. These issues

persist alongside infrastructure problems, procedural complexity, and policies, as well as cost instability [16].

Therefore, achieving a condition of transparency in all logistical flows is crucial to ensure fast and secure transmission of information, products, and money. The IoT and Blockchain present two emerging technologies, instruments of social change that are beginning to attract researchers in the logistics domain for sustainable development [17].

The first technology aims to create an interconnected system that links all equipment and devices through their intelligent sensors and cards using Internet functions. Meanwhile, the second aims to improve the previous operation performed by the IoT and ensure its provision of secure and reliable data transmission [16].

Blockchain was initially created to manage Bitcoin as a digital currency. This new concept is then transmitted to the supply chain by providing secure, reliable, traceable, and authentic data between supplier and consumer, regardless of their location [18].

2.4. Processes in the supply chain

To efficiently utilize supply chain management, it is necessary to establish end-to-end procedures involving all stakeholders and the objectives that must be achieved for the company to gain a competitive advantage in the market. Each intermediate level must perform efficiently for the organization to operate optimally, thus, they must be internally organized to work in alliances with external partners [19].

According to the systematic vision of a company's future, it is structured in the following phases:

(1) Analysis of the initial situation (stated analysis),
(2) Identification of strategy options (target-development),
(3) Actual strategy development (road mapping),
(4) Implementation of the strategy (implementation),
(5) Design of a continuous process (iteration).

These basic components are also reflected in the development of the digitization strategy and form the basis of the respective procedural models. The starting point for digital strategy development is the analysis of the current situation (state analysis).

Strategic decisions must be based on both internal inventory and environmental analysis. Therefore, strengths and weaknesses must be considered. Additionally, factors such as technologies and technology trends must be contemplated. This involves analyzing stakeholders, the market, the distribution channel, and currently developed technical conditions [16].

The approach to intersectoral strategic planning for the digital transformation of small and medium-sized enterprises (SMEs) is divided into a procedural model and a set of methods. The procedural model is based on the phases of management strategy and the six phases.

The procedures presented differentiate between (1) strategic forecasting, (2) analysis of state and target market for offer development, (3) analysis of state and target market for value creation, (4) evaluation and roadmapping, and (5) iteration and implementation.

In the first phase, a strategy forecast is made based on future trends. This essentially involves checking which future trends will have the greatest influence on the future design of the company (phase 1). These trends must be considered in the state market offer analysis and objective development (phase 2) and value creation (phase 3). In the analysis and development of objectives, both the initial state and the anticipated future state for both the organization's services and products and business processes are recorded in detail and analyzed against the background of trends [7].

The results of this phase are the market offer and value creation strategy, supported by specific use cases.

Based on this, strategy options and use cases are evaluated according to their costs and benefits, as well as their strategic fit with respect to future trends, and transferred to an action plan of a so-called roadmap (phase 4). Finally, the implementation of measures along the roadmap (phase 5). To include the idea of strategic leadership, the procedure must be regularly repeated [20].

Table 1. Methods kit and configured strategy process [21]

	Strategy development phases				
	Strategic forecasting (stated analysis)	**Analysis of state and target market for offer development (target-development)**	**Analysis of state and target market for value creation (target-development)**	**Evaluation Roadmap (road mapping)**	**Implementation and Iterations (implementation) (iteration)**
Methods	Trend analysis	Customer journey analysis	Process analysis	Portfolio analysis	Project configuration
	Vision	Product lifecycle study	Business process analysis	Roadmap	Balanced scorecard
	Scenario technique	Sectoral and market analysis	Competitive analysis		Annual review
		Customer analysis	Technology analysis		

The methods kit is structured throughout the five phases of strategy development. The case contains different methods that can be used per phase within the framework of strategy development for SMEs. Depending on the company's framework conditions (sector, products, company size, etc.), methods from the methods kit can be selected and applied as needed.

Especially for SMEs, a specific strategy based on needs and the application of certain methods makes sense, so that a specific company strategy process results from the set of methods. Both the industry use case and the strategy process, including the methods required for it, can generally be seen in **Figure 1**; the individual contents of strategy development are presented below.

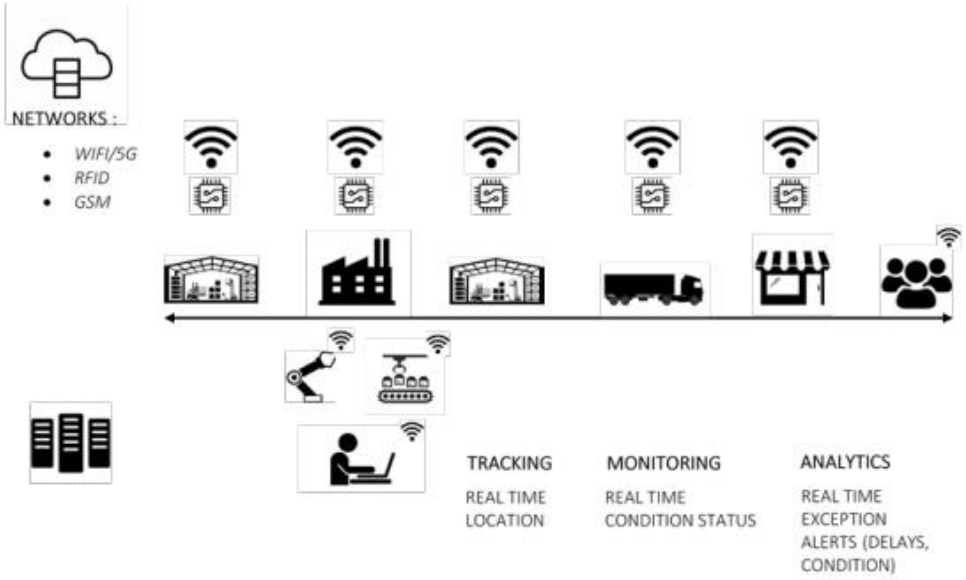

Figure 1. The architecture of the equipment monitoring system. The figure displays the architecture of the smart supply chain showing all processes and equipment.

2.4.1. Phase 1: Strategic forecasting

In the first phase of the industry use case, both internal and external influencing factors are examined more closely. At this point, no specific differentiation is made by sector. The field of "stakeholders" in which the company is located is elaborated in the form of a stakeholder map.

Internal stakeholders such as global and economy-related ones are identified. In a subsequent step, the impact of selected trends on stakeholders is discussed using technology and trend analysis. The industry analysis conducted earlier forms the basis of technology and trend analysis. Here, trends relevant to the industry were investigated and evaluated regarding their impact on the identified stakeholders. An urgent assessment of the trend and its impact on the company must also be made; the result of the trend analysis is a portfolio.

Based on this, urgent and strong trends can be identified. The final selection should include both trends affecting value creation (internal effects) and trends affecting market offerings (external effects). In this way, future directions for value creation and market offerings can be defined. Based on these directions, the digital vision for the company can then be derived.

2.4.2. Phase 2: Analysis of state and target market for offer development

In the second phase, it is important to deepen the vision regarding market offerings and develop a clear digital target image for market performance. This process must be designed individually, as it is conditioned by the formulated vision.

In the metallurgical/manufacturing tools industry, the focus is on smart tools. In this case, a product lifecycle analysis can be used to shape this vision.

In the first step, the unique selling points of the product are elaborated. Then, throughout the product lifecycle of a tool, the current performance/services of the product are recorded, but also customer challenges, as well as potential for new digital product services, are identified.

The canvas guides during the product lifecycle, starting with development through production, dispatch, training, operation, and recycling of a product. The result of the product lifecycle study, this analysis is the potential for digitizing new services for the respective product. These are documented as the so-called focus themes [7].

2.4.3. Phase 3: Analysis of state and target market for value creation

According to the process map in the company, all value in the creation processes is analyzed in phase 3, taking into account the sociotechnical dimensions (people, organization, and technology). Special attention is paid to the data that is already available in the process today and in which process steps there are system interfaces for adjacent activities [20].

The result of this step is an overview of the current state of digitalization of individual processes. Based on this, the next step is to derive digitization potential in the company's processes and transfer it into a target image. The target image contains concrete target states that the company should implement in the context of digital transformation. Care must be taken to ensure that digitization potentials are conceived in the sociotechnical dimensions on one hand and adequately address the future trends identified in phase 1.

2.4.4. Phase 4: Evaluation and planning

The digitization potentials focused on the themes identified in phases 2 and 3 are now evaluated based on their cost-benefit relationship. At the same time, it must be ensured that the digitization potentials contribute to the digital vision.

Next, the potentials are transferred to the roadmap as concrete measures. By ordering the measures in

terms of time, it must be ensured that the preconditions of the individual measures are taken into account and that synergies can be leveraged during implementation [16].

2.4.5. Phase 5: Iteration and implementation

The implementation phase is the greatest challenge in this process. One possible reason for failure is getting bogged down in daily operations. To address these challenges, a project setup must be defined and documented for implementation. Here, elements of the roadmap are transferred to a clear project structure. In addition to prior time commitment, individual potentials and measures also receive clear budgeting and resource planning, as well as responsibilities. From now on, these form the project management office, which communicates regular status and reports project results. Furthermore, it is advisable to develop a 100-day plan specifying which measures will be implemented with what level of implementation and effectiveness, also known as severity level, within the first 100 days.

The structure is based on the action areas of the roadmap. Parallel to implementation, the previous roadmap should be reviewed annually to ensure it is up-to-date. Likewise, the methods can be reused [22].

2.5. Advantages

Digital transformation helps in cost reduction, streamlining distribution, increasing transparency in the supply chain, as well as improving the accuracy of projections and compliance with various regulations. Additionally, it enhances different distribution and production lines, the utilization of smart devices, and the use of robotics [4].

To carry out the transformation of the supply chain and production, different technologies are applied such as real-time process monitoring, predictive maintenance, cost reduction, big data analysis, and the use of sensors in production lines [21].

The use of new technologies is gathered into three fundamental blocks: smart supply chain, IoT, and blockchain.

2.5.1. Smart Supply Chains

Smart supply chains, or Supply Chain Management (SCM), are defined as a controlled grouping of all processes and equipment contributing to the creation of added value according to the concept of customer-to-customer. SCM goes through many stages starting from the customer and ending with the customer. The main limitation of any chain is to produce the right product under appropriate circumstances and at the right place while respecting the correct cost. SCM manages to make this constraint disappear by using an accurate monitoring system along the chain and through the three physical, informational, and financial flows. This system participates in the digital transformation of the supply chain from providing new solutions using advanced analytics, to optimizing SCM through artificial intelligence and the IoT [23].

These technologies are considered key to smart logistics. However, the supply chain still faces many technical and organizational challenges, such as production and shipping delays, excess or insufficient storage, and shortages and interruptions of raw materials. Faced with these logistical challenges, many developed countries have implemented measures to help distribute the gains from contributions in global value chains to the rest of the economy. These strategies highlight national productivity integration and proactive engagement and learning among governments, global businesses, local suppliers, and human resources [4].

In particular, the adoption of new technologies by leading organizations imposes new demands on the elements of the supply chain, as competitive advantage today is based on skills, services, and infrastructure.

2.5.2. Internet of Things

The concept of the IoT first appeared with Wireless Sensor Networks (WSN) in 1998. Due to technological progress, electronic devices have improved their requirements in relation to new industrial constraints. The microcontroller unit (MCU), digital radio transceivers, and sensors are the main components of IoT equipment developed: MCUs are small in size, consume less power, and are very economical, digital radio transceivers [24].

The transceivers are easy to configure and provide energy-efficient functionality, and the sensors are the tool for identifying any physical properties. However, device memory remains a significant limitation in the new generation of IoT devices. As technological limitations increase, the need for a new way of connecting objects becomes essential. As a result, many standardization bodies have begun designing protocols such as IPv6 over IEEE 802.15.4 networks (6LoWPAN). The Internet Protocol (IP) persists as a network system protocol that works well, enabling end-to-end connectivity between interconnected devices through Internet functionalities [23].

2.5.3. Blockchain

Blockchain is an emerging technology that has introduced a new concept of distributed databases. It works by storing and transmitting data in a decentralized, transparent, and secure manner. Blockchain allows users to share, publicly or privately, all digital events that have been executed and shared on the same chain [25].

Blockchain consists of blocks, each block containing distributed data shared or executed by users. These transactions are protected by complex algorithms that allow users to create and enforce agreed-upon rules that ensure data security. This makes it tamper-proof for all users, including system administrators [24].

Blockchain is a unique platform system with multiple areas of application. To add a new operation to the blockchain, many transactions involve the chain nodes as shown in **Figure 2**. The newly created block is characterized by decentralization and security. It goes through 5 stages.

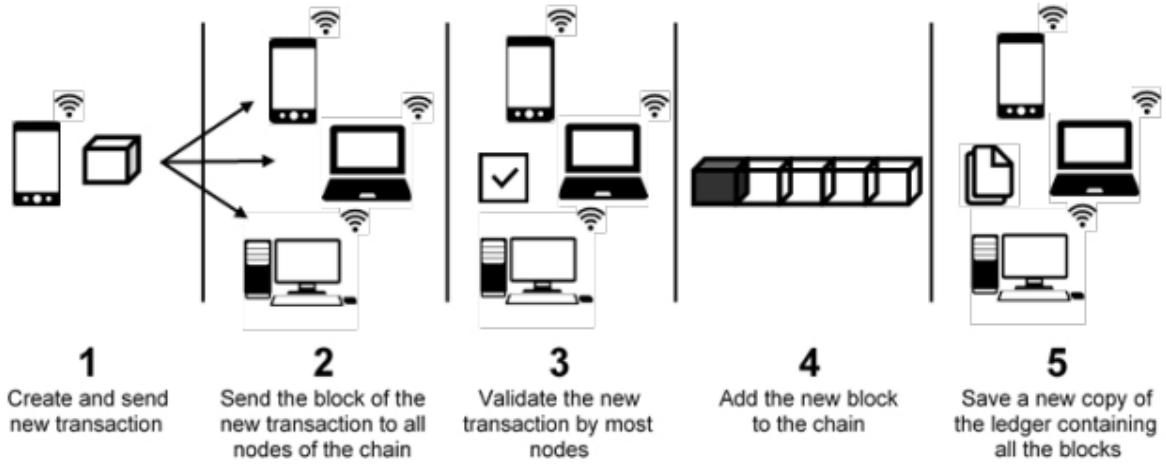

Figure 2. Steps to create a new block. The figure shows the steps to create a new block introducing a new concept of database.

2.6. Legal foundations

In Ecuador, there is a set of legal regulations, such as laws, regulations, resolutions, and decrees, among others. Among them are legal regulations related to the research topic such as:

(1) Trade Law.
(2) Industrial Safety Law.
(3) Law and Statutes of Technological Development.

3. Methodology

The present research is non-experimental and documentary in nature, according to Baena [26], these are investigations in which information related to digital transformation in the supply chain was analyzed and selected. Adequate data collection was carried out to help rediscover events, as well as to determine other sources of search, and to examine the development of research instruments.

The method applied in this study is analytical, with a descriptive research level, which collects information obtained from high-impact scientific journals in databases such as Scopus, Web of Science, ScienceDirect, and Google Scholar, conducting measurement, analysis, and explanation based on this information.

The purpose of the research according to Hernández *et al*. "specifies the properties, characteristics, and important features of any phenomenon that is subjected to analysis" [27], meaning that variables such as the supply chain and adaptation to the new digital era in industries were measured concretely by thoroughly analyzing all the results obtained.

Within the research techniques, the following inclusion criteria were stipulated for the bibliographic search: scientific articles or journals with a maximum age of 10 years and material or relevant guides to the current topic. The exclusion criteria for this search were private articles without free access and web pages, blogs, and monographs. The data collection instrument was conducted through a questionnaire with open-ended questions, and the results were examined specifically through interviews with individuals involved in industrial companies that have undergone digital transformation processes in supply chain management.

4. Results

Table 2. Interview

Question	Answer
1. What would you consider the main impact of digital transformation on industrial companies in Guayaquil?	R1: Technology adoption will bring increased productivity, agility in procedures and processes, fewer errors, and cost reduction. R2: The impact is reflected in increased production with lower costs and higher quality. R3: Industries have adapted to the environment due to competitiveness; therefore, companies are updating with new communication or transportation technologies to achieve a better level of competitiveness. R4: It improves worker satisfaction, making them more productive, and their operational efficiency also increases. Digitizing processes to increase sales levels generating greater profitability. R5: There are various improvements such as employee satisfaction in being more productive, achieving operational efficiencies, in the customer experience by automating some processes, and relating in a simpler and faster way with the consumer.
2. What new challenges do you consider that companies nowadays can achieve with digital transformation?	R1: Changing managers' mindset to consider technology as an investment rather than an expense. R2: Having a connected industry to measure efficiency in real-time, understanding where improvement opportunities exist, comprehending, doing, and improving things. R3: For large companies, it is easier to adapt to new technologies due to ease of financing, while for medium or small companies, it is difficult because they must choose how to finance either in the short or medium term. R4: Anticipating changes, describing and predicting phenomena, creating new value propositions, partnering with other companies, and preparing for new competencies. R5: Adapting to changes in organizational culture driven by the use of technological tools, involving all people to participate.
3. What business opportunities does the application of digital transformation offer companies to optimize supply chain processes?	R1: Promotion of products worldwide, opening new markets, generating lower costs in the provision of raw materials, and timely access to inputs for manufacturing, being competitive, and improving marketing. R2: Ensuring that products reach customers effectively, meaning they arrive at lower costs without compromising quality. R3: Having many local or foreign suppliers, analyzing their cost levels, and the options they provide. R4: Cost reduction, greater analytical capacity, improved communication. R5: The innovation fostered by the use of new technologies, data analysis, and business intelligence, improvements in times, processes, and agility that generate greater customer satisfaction and competitiveness.

Table 2 (Continue)

Question	Answer
4. What are the main technological needs in the supply chain process in industrial companies?	R1: The application of information systems (if possible customized) that allow decision-makers in this activity to make duly supported decisions. R2: A scalable network infrastructure ensuring that all processes are connected and emitting information. R3: Communication helps to update the technologies used by the company, as well as managing information in a secure location. R4: Monitoring and readjusting their modus operandi; increasing the chances of success in an increasingly competitive environment. R5: Automation of demand management processes, sales forecasting, material explosion, material needs, procurement planning, and inventory optimization.
5. Through digital transformation, what advantages do companies obtain in the supply chain process?	R1: Lower costs, reduction of errors, and process agility, among others. R2: Cost reduction, opportunities for process improvement. R3: Improve competitiveness. R4: Competitive sales, drives innovation culture, improves productivity, greater brand presence, emphasizes data, reduces costs. R5: Customer satisfaction, improvements in dispatch agility, forecast accuracy for sales, and optimization of inventory usage.
6. What level of importance should companies consider when actively participating in digital transformation to leverage benefits and maximize profitability?	R1: Managers should consider it an investment, a tool of vital importance to improve profitability. R2: Digital transformation is a high investment and even a cultural change as it brings an impact on how people work. R3: It is an investment, both in updating technologies and internal and external communication systems, ultimately improving communication with external and internal customers. R4: Without this digital technology, a business will hardly advance in the market and be competitive. R5: The digital transformation of the company should be one of the strategic pillars of the company to foster its development in the medium and long term, it must be supported at all levels, and accompanied by a strategic plan.

Note. The table shows interviews conducted with individuals related to the digital transformation of supply chains.

In the results obtained regarding the revolution of digital transformation in industrial companies in the city of Guayaquil, it is mentioned that among the new challenges organizations currently face to achieve digital transformation is the financing required to implement this strategy. For example, large companies with good purchasing power had a good adaptation, whereas, for medium or small companies, it was a bit more difficult to choose how to sponsor the implementation. They also emphasize the change in mindset of managers in thinking that technology is not an expense, but an investment. Another challenge is to create a new perspective that helps measure efficiency in real-time, anticipate changes, and create value propositions to optimize efficiency in organizational methods.

Regarding the commercial opportunities obtained by implementing digital transformation in supply chain processes, it was beneficial to have multiple suppliers, both local and foreign, to facilitate the analysis of cost levels, the provision of raw materials, and necessary inputs in manufacturing, thus improving commercialization and ensuring products reach customers efficiently with lower costs without compromising quality.

According to the results, when implementing digital transformation in supply chains in industrial companies, the main technological needs were communication as a first factor to update technology; having information in a secure place, meaning a scalable network infrastructure that allows all processes to be interconnected and emitting information, as well as software that is connected to processes to obtain immediate information with low human intervention.

On the other hand, with the implementation of digital transformation in supply chains, processes adapted to the environment due to the competitiveness in the market. Companies updated themselves in the management of new technologies, both in communication and transportation. This change was seen as an investment in external and internal communication systems and customers. This tool is one of the strategic pillars that fostered

medium- and long-term development. The digital age is an element that changed people's habits, making them more demanding and better informed, representing a challenge for companies to reinvent themselves and provide consumers with good experiences through their end product, intensifying their experience. As a consequence, greater profitability was generated through sales levels.

The advantages obtained by carrying out digital transformation in the supply chain included process improvement and competitiveness, higher quality, agility in processes and procedures, increased production with lower costs, dispatch agility, fewer errors, customer satisfaction, significantly improved worker satisfaction, operational efficiency, and productivity. With this transformation, a cultural change occurred among workers, driven by innovation and creativity.

5. Discussion

Digital transformation through a supply chain involves using technological and innovative resources through a logistics network in each area of a company, which helps to work together to create a defined and efficient operation.

It is demonstrated that industrial companies, by implementing digital transformation of the supply chain, will achieve data automation, agility, and efficiency in information, as well as digital systems. It should be noted that procedures among supply chain elements have benefited from technology, being a tool that helps optimize tasks for joint work.

According to the research conducted, it is observed that digitized supply chains evolve industrial companies, which made it possible to understand that planning, communications, and strategies favor digital transformation in organizations. Therefore, information management provides quick, effective, and complete responses to any eventuality. It is an important element for the well-being of an environment of integration and trust to obtain information efficiently and promptly, improving activities and processes incorporated into the supply chain.

In Ecuador, there is a high demand from companies that have general knowledge of cryptocurrencies, which has attracted many individuals and companies to opt for this type of investment. However, the lack of specific knowledge about the use of blockchain applications has caused fear and uncertainty when deciding to invest money, which could be the decisive factor in its adoption within the Ecuadorian financial system.

Several entrepreneurs in the private industrial sector of Guayaquil argue that blockchain technology is a way to improve their processes by reducing strategic waste such as processing times, decreasing costs, and increasing system security, transparency, and stability. This is because the true potential of the technology will be observed in a larger network through rapid adoption, generating new business models through decentralized public applications that help develop infrastructure, where adoption requires the articulation of technological, political, social, and economic spheres to reach a maturity phase. If today there is a robust ecosystem that still lacks development in racial and social issues.

Therefore, the influence of blockchain technology is being mainly adopted by the financial industry to improve its processes and services. However, its use is also feasible in other private sectors such as supply chain, legal, healthcare, social, educational, energy, and sustainability. Companies that base their business models and plans on marketing by recording the exchange of information and value through any type of activity are the most at risk of being economically and financially impacted by blockchain technology through decentralized applications that seek to benefit all their members. These types of companies will seek ways to reduce the risks of technology, either by incorporating it or by changing their program models, business plans,

and market research.

6. Conclusions

In the process of implementing this digital evolution of supply chains, the need for a scalable network infrastructure that connects to all processes and emits immediate and secure information is identified. This allows for monitoring operations in an automated manner to manage demand and forecast sales. Digital collaboration was strengthened through the execution of technological tools and platforms connected to a network, which generates various fundamental benefits to the supply chain, the most outstanding of which is surveillance of consumer needs and their relationship, as well as effective communication, real-time information, data analysis for planning, and observation of each phase of the process.

It is considered that by implementing these processes in the supply chain, there was control over procedures, prompt solutions to changes, promotion of the construction and systematization of linked planning, application of strategies, and very good interaction among the elements of the supply chain. Therefore, by executing this technological tool, reliability was obtained at each phase of the process, greater visibility of any event, prevention of any incident, and data analysis for planning. The digitization of supply chains favored control strategies, trust, improved skills of the parties, management of finished product inventories, and development and integration of supply chain participants, intending to interpret the different changes produced by the environment. In summary, digital transformation in the supply chain positively impacted communication due to improvements in control, organization, automation, and access to information for all involved in supply chain fulfillment.

Digitizing the supply chain produces various benefits such as significant progress in connecting with consumers and addressing their needs, effective communication, real-time information acquisition, cooperative environment of suppliers and distributors allowing them to respond to environmental needs. Furthermore, it was confirmed that there were improvements in information accuracy and quick solutions, which favor agile and effective communication, as well as the transmission of demand data in an adequate and timely manner for inventory replenishment management, contributing to the integration of operations for common goals among the elements of the supply chain.

From the data presented in this research, it is clear that digitized supply chains evolve industrial companies, making it possible to understand that planning, communications, and strategies favor digital transformation in organizations, providing quick, effective, and complete responses to any eventuality. It is an important element for the well-being of an environment of integration and trust to obtain information efficiently and promptly, improving activities and processes incorporated into the supply chain.

Bitcoin savers could accelerate a revolution in the history of thought. This technology seeks to change the way transactions and contracts are made, promising to eliminate some of the problems derived from information asymmetries, thus creating contracts where they did not exist before. Despite all its virtues, its implementation is still very limited and requires complete and regulated sources of information for its proper functioning. It will be left for future work to analyze the impact that this technology has on the value chain of a particular company.

Disclosure statement

The authors declare no conflict of interest.

References

[1] Sampietro-Saquicela JL, 2020, Digital Transformation of Industry 4.0. Polo del Conocimiento, 5(8): 1344 – 1356. https://doi.org/10.23857/pc.v5i8.1666

[2] Ynzunza-Cortés CB, Izar-Landeta JM, Bocarando-Chacón JG, 2017, Implications and Perspectives of Industry 4.0. Conciencie Tecnológica, 54: 33–45.

[3] Ramírez Pedraza GG, 2019, Detección de Factores Clave en la Cadena de Suministro Actual para Empezar a se Industria 4.0 [Detection of Key Factors in the Current Supply Chain to Begin Industry 4.0], thesis, National Technological Institute of Mexico in Selaya.

[4] Rodríguez Calderón G, 2020, La Colaboración Digital en la Cadena de Suministro [Digital Collaboration in the Supply Chain], thesis, University of Lleida.

[5] Trafaniuc V, 2021, ¿Cómo la Tecnología Puede Ayudar en la Cadena de Suministro? [How Technology Can Help in the Supply Chain?] Maplink, viewed December 29, 2022, https://maplink.global/blog/es/tecnologia-en-la-cadena-de-suministro/

[6] Granillo Macías R, González Hernández IJ, 2021, Selección y Evaluación de Proveedores de Logística Externa en la Cadena de Suministro: Una Revisión Sistemática [Selection and Evaluation of External Logistics Providers in the Supply Chain: A Systematic Review]. Management Letters Cuadernos de Gestión, 21(2): 7–18. https://doi.org/10.5295/cdg.191141rg

[7] Annarelli A, Battistella C, Nonino F, et al., 2021, Literature Review on Digitalization Capabilities: Co-Citation Analysis of Antecedents, Conceptualization and Consequences. Technological Forecasting and Social Change, 166: 120635. https://doi.org/10.1016/j.techfore.2021.120635

[8] Sánchez MA, Ramoscelli G, 2018, Value Creation from the Internet of Things: Exploratory Study in Buenos Aires Province. Visión de Futuro, 22(1): 149–169.

[9] Mendelson H, 2014, Modelos de Negocio, Tecnologás de la Informacion y la Empresa del Futuro [Business Models, Information Technologies, and the Company of the Future]. OpenMind BBVA, viewed December 29, 2022, https://www.bbvaopenmind.com/articulos/modelos-de-negocio-tecnologias-de-la-informacion-y-la-empresa-del-futuro/

[10] Carmona B, 2021, Transformación con Sentido: ¿Cómo Hacer Realidad la Transformación Digital en las Empresas? [Transformation with Meaning: How to Make Digital Transformation a Reality in Companies?] EY, viewed December 29, 2022, https://www.ey.com/es_ve/transformacion-con-sentido/como-hacer-realidad-transformacion-digital-empresas

[11] Épico, 2021, Épico Conquito y Citec Forman Alizana Para la Consolidación de Clústeres de Tecnología en Guayaquil y Quito [Épico Conquito and Citec Form an Alliance for the Consolidation of Technology Clusters in Guayaquil and Quito]. Épico, viewed December 29, 2022, https://epico.gob.ec/epico-conquito-y-citec-forman-alianza-para-la-consolidacion-de-clusteres-de-tecnologia-en-guayaquil-y-quito/

[12] Byte TI Editorial Team, 2022, Transformación Digital de la Industria: Los Datos Son El Nuevo Petróleo [Digital Transformation of the Industry: Data is the New Oil]. Revista Byte TI, viewed December 29, 2022, https://revistabyte.es/actualidad-it/transformacion-digital-industria/

[13] Guerra Villalta CE, Torres Rivadeneira LM, Sumba Nacipucha NA, et al., 2022, Transformación Digital: Alternativa de Crecimiento Para Emprendedores Universitarios [Digital Transformation: Growth Alternative for University Entrepreneurs]. INNOVA Research Journal, 6(3): 211–226. https://doi.org/10.33890/innova.v6.n3.2021.1744

[14] Manrique Nugent MAL, Teves Quispe J, Flores Morales JA, 2019, Supply Chain Management: A Look for the Theoretical Perspective. Revista Venezolana de Gerencia, 24(88): 1136–1143.

[15] Calatayud A, Katz R, 2019, Cadena de Suministro 4.0: Mejores Prácticas Internacionales y Hoja de Ruta para América Latina [Supply Chain 4.0: Best International Practices and Roadmap for Latin America]. Banco

Interamericano de Desarrollo, viewed December 29, 2022, https://publications.iadb.org/publications/spanish/document/Cadena_de_suministro_4.0_Mejores_pr%C3%A1cticas_internacionales_y_hoja_de_ruta_para_Am%C3%A9rica_Latina_es.pdf

[16] Birkmaier A, Oberegger B, Felsberger A, et al., 2021, Towards a Robust Digital Production and Logistics Network by Implementing Flexibility Measures. Procedia CIRP, 104: 1310–1315. https://doi.org/10.1016/j.procir.2021.11.220

[17] Chávez-Díaz JM, Bonilla Migo A, Monterroso Unuysuncco NI, et al., 2023, Gestión para la Recaudación de Impuestos Municipales: Diagnóstico y Propuesta [Management for the Collection of Municipal Taxes: Diagnosis and Proposal]. Revista Venezolana De Gerencia, 28(103): 1052–1067. https://doi.org/10.52080/rvgluz.28.103.9

[18] Arauco EWQ, Romero-Carazas R, Romero IA, et al., 2022, Factors and Economic Growth of Peruvian Mypes. International Journal of Professional Business Review, 7(3): e0689. https://doi.org/10.26668/businessreview/2022.v7i3.e0689

[19] Joyanes Aguilar L, 2017, Industria 4.0: La Cuarta Revolución Industrial [Industry 4.0: The Fourth Industrial Revolution]. Alfaomega Grupo Editor, Mexico.

[20] Yang S, Hamann K, Haefner B, et al., 2018, A Method for Improving Production Management Training by Integrating an Industry 4.0 Innovation Center in China. Procedia Manufacturing, 23: 213–218. https://doi.org/10.1016/j.promfg.2018.04.019

[21] Förster M, Kürpick C, Hobscheidt D, et al., 2022, Cross-Industry Methods for Strategic Planning of the Digital Transformation of Small and Medium Sized Enterprises. Procedia CIRP, 109: 322–327. https://doi.org/10.1016/j.procir.2022.05.257

[22] Romero-Caraza R, Rincón Soto IB, Marín-Rodriguez W, et al., 2023, Bibliometric Analysis of Scientific Production on Systems Thinking in Students. Revista Bibliotecas. Anales de Investigacion, 19(1): 1–13.

[23] Chbaik N, Khiat A, Bahnasse A, et al., 2022, The Application of Smart Supply Chain Technologies in the Moroccan Logistics. Procedia Computer Science, 198: 578–583. https://doi.org/10.1016/j.procs.2021.12.289

[24] Ghosh S, Hughes M, Hodgkinson I, et al., 2022, Digital Transformation of Industrial Businesses: A Dynamic Capability Approach. Technovation, 113: 102414. https://doi.org/10.1016/j.technovation.2021.102414

[25] Osterrieder P, Budde L, Friedli T, 2020, The Smart Factory as a Key Construct of Industry 4.0: A Systematic Literature Review. International Journal of Production Economics, 221: 107476. https://doi.org/10.1016/j.ijpe.2019.08.011

[26] Baena Paz G, 2017, Metodología de la Investigación. Serie Integral por Competencias. [Research Methodology. Comprehensive Competency Series], 3rd edition. Grupo Editorial Patria, Mexico.

[27] Hernández Sampieri R, Fernández Collado C, Baptista Lucio P, 2010, Metodología de la Investigación [Research Methodology], 5th edition. McGraw-Hill Interamericana de España S.L., Madrid.