

## **Logistics 4.0 in organizations: a theoretical approach**

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### **ABSTRACT**

Currently, service providers have been implementing new technologies to improve the service to their consumers, at the same time that it makes possible the optimization of resources it forms the reduction of the costs.

In this sense, the objective of this work was to analyze the effects of changes and the benefits that logistics 4.0 provides in service providers. For this, this research is structured in a qualitative approach of exploratory nature, with data collected through a bibliographic search in scientific articles that discuss Logistics 4.0. The research findings show that the result of the change in the institutions occurred through Logistics 4.0, an innovative tool that is based on the insertion of new technologies that benefit companies in the competitive scenario in which they are inserted. The solutions brought by Logistics 4.0 are called Big Data, Internet of Things (IoT), Artificial Intelligence (AI), Blockchain, among others. It was evidenced in the study, that these tools enable organizational growth, and contribute to an increase in productivity and efficiency in the operations carried out in the companies providing services.

**Keywords:** internet of things, artificial intelligence, information management, big data, blockchain.

## 1 INTRODUCTION

The service sector is complex, this is because it covers a wide range of activities, and it is possible to classify services based on marketing characteristics that help explain theories and phenomena (BRANSKY; LIMA JR, 2010). Service providers have received the implementation of new technologies that have been taking place in Brazil since the late 1970s. Searching for better ways to serve the client and offer an information and management control system capable of reducing costs, it is necessary to incorporate into the work process technologies that make this objective feasible (GONÇALVES, 1994).

The technology had a great impact on the drivers of financial institutions, mainly banks because driven since the arrival of the internet, there were changes in the concepts of service provision and new technologies were adopted, such as access to the banking system via magnetic cards, self-service, home banking and mobile banking (TACHIZAWA; POZO; FURLANETI, 2017). This optimization of physical and electronic channels allows access to a larger percentage of the population, making it an effective economic and political tool with a wide reach. It can be said that virtual or electronic channels occupy an increasing space in the financial sector, being crucial for the transformation of banking logistics around the world, generating changes and great opportunities (BADER; SAVOIA, 2013).

Thinking about technology, it can be said that with the emergence of Information Technology (IT) and its implementation in business models under demand orders, there were new management concepts to be considered in the logistics sector, such as the interaction of equipment, machines, products, among others, with man through the internet, this became possible through logistics 4.0, being thus considered a tool for change and improvement based on the implementation of innovative technology so that it is possible to survive in increasingly competitive environments (PACHECO; REIS, 2019).

In Latin America, the financial industry varies between 20% and 30% in total IT investment. It can be assumed that this is because the computer has a strong impact on banking operations, making the banking industry, perhaps, the most computerized of all today. From this quote, it appears that the banking sector is one of the largest investors in IT, being very dependent on this technology in its products and services (BECKER; LUNARDI; MAÇADA, 2003).

The term industry 4.0 emerged in Germany, being quickly spread across Europe, and can be defined as an evolution of the manufacturing concepts that are used to achieve the objectives of continuous improvement of processes and performance. Beyond it, Industry 4.0 is a system that, in addition to connecting machines, creates a network of machines, assets, information systems throughout the product's life cycle and value chain, that is, it consists of the fourth industrial revolution (FRAGA; FREITAS; SOUZA, 2016).

Based on the perception that Logistics 4.0 derives from Industry 4.0, it can be said that this new logistics focuses on the use of technology as the greatest associate of organizational growth, automating processes, and consequently contributing to increased productivity and efficiency in operations. To make this possible, solutions are used, some of which are called Big Data, AI - Artificial Intelligence, and Internet of Things (Internet of Things - IoT) (ALMEIDA et al, 2019).

Given the theme related to logistics 4.0, the present research has as its problem to answer the following question: How Logistics 4.0 is influencing the operational performance of services in companies? To answer the problem raised, this research aims to analyze the effects of the changes that logistics 4.0 provides in the services provided by companies.

The relevance of the study is because logistics 4.0 is an advanced technology used by companies, that through technological solutions manage to increase productivity, quality, and efficiency, enabling cost reduction and agility in delivery times to better serve the customer and the demands demanded, bringing competitiveness to the global market and benefiting the entire logistics chain, from the supplier to the end customer (SILVA; KAWAKAMI, 2019). The service sector is complex, this is because it covers a wide range of activities, and it is possible to classify services based on marketing characteristics that help explain theories and phenomena (BRANSKY; LIMA JR, 2010). Service providers have received the implementation of new technologies that have been taking place in Brazil since the late 1970s. Searching for better ways to serve the client and offer an information and management control system capable of reducing costs, it is necessary to incorporate into the work process technologies that make this objective feasible (GONÇALVES, 1994).

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## **2 THEORETICAL REFERENCES**

This reference addresses logistics, its relationship with the services area, logistics 4.0, and the tools used within that logistics 4.0.

## 2.1 LOGISTIC

Initially, logistics was defined by its actions in the military area, more precisely in the First World War, based on the way resources were delivered in the right place at the right time, to win battles. Although the concept was not yet consolidated at that time, it was seen that planning to achieve a greater objective was present since 1914. After the Second World War, objectives began to be outlined, strategic, tactical, and operational logistics tools and components (CANO; SILVA, 2018).

According to Cano e Silva (2018), the emergence of the concept of logistics in Brazil occurred in the year 1970, and initially, the term was associated with activities related to sales, transportation, and regional warehouses. After some time, when companies started to better organize activities and their areas, it was possible to direct its focus to a well-designed logistics system, easily identifiable and standing out in some segments, such as the auto industry.

Thinking about customer service, which includes elements from availability to after-sales maintenance, it is seen that customers always evaluate offers on products and services, in terms of price and quality of any company, and decide whether to take advantage of or ignore these offers. Based on this, it is important to decide the level of services to be offered to customers and all their logistics, since the revenue generated by sales to the customer and the costs with the system's design determines the profits that will be obtained by the company, being fundamental in the implementation planned profitability. (BALLOU, 2004).

The service sector can be defined by various authors as economic activities that do not generate a physical product or construction, it is produced and consumed simultaneously, having its added value in the form of fun, convenience, opportunity, among others (BRANSKY; LIMA JR, 2010).

The classification of services is divided into five categories, these being: Nature of the service act; Type of relationship that the service organization has with its customers; Personalization and judgment in service delivery; Nature of demand and supply for services; Service support. During the so-called consumer decade, in the mid-1990s, manufacturing, and services joined forces to enhance actions, seeking to best serve the needs of consumers, and for this reason, services have been integrating actions in the manufacturing sector (AYRES, 2009).

Teaching that services and manufacturing differ in several aspects, but that at the same time many manufacturing activities involve services and many services involve physical goods, it can be said that the definition of logistics mainly represents the processes that occur in manufacturing. To identify and describe the role of logistics in the service sector, work was carried out by the CSCMP (at the time Council of Logistic Management - CLM), this study aimed to study logistics starting from two processes: the traditional process associated with the service called Supply Chain Logistics (SCL) and also the process

related to the management and planning of the company to deliver the service, this being the Service Response Logistics (SRL) (BRANSKY; LIMA JR, 2010).

The Supply Chain Logistics (SCL) process encompasses manufacturing elements associated with the purchase and distribution of physical goods, being important in the service industry, however thinking about companies that operate in the financial sector, the management and planning process of the company called Service Response Logistics (SRL) is considered to be of the utmost importance, as it is responsible for the “non-physical” part in charge of delivering the service, adding elements that accelerate the important issues for service delivery and optimization of the service infrastructure, aiming to better meet the needs of customers. These elements are service capacity, staff scale, waiting time management, demand planning, building partnerships, and managing information and quality, this group is considered the main focus of service operations and has a major impact on the competence of offer the service (TARCHETTI, 2010).

Based on the SRL concept, it is possible to observe how much the banking sector benefits from this process, as the objective of banks is to be always available and deliver the best services, thus obtaining the maximum number of customers and increasing their profitability. Among the advantages of digital transformation for the financial sector, we have a better relationship with the client, lower abandonment rate, greater capacity for investments and organization (MAGNUS, 2018).

Although the service area is popularly seen predominantly as a business with only one owner and that operates only in small geographical areas, it is possible to observe that organizations can be large, global, and diversified, because as it is seen, a relevant portion of the largest five hundred Brazilian companies operate specifically in the services area, being these: banks, construction companies, air transport, health, public services, among others (AYRES, 2009).

## 2.2 LOGISTIC 4.0

The expression Industry 4.0, from which Logistics 4.0 derives, had its beginnings at the 2011 Hannover fair in Germany, being an innovative production model that proposed a rapid advance in technology, low cost, and more efficient production lines. With that, in the decade of 2010, the so-called fourth Industrial Revolution (Industry 4.0) arises, bringing mass production and personalization of the production line, combined with technologies such as augmented reality, robotics, nanotechnology, big data, artificial intelligence, Internet of Things (Internet of Things), to give rise to a world in which physical and virtual manufacturing systems have a global and adaptable functioning (SILVA; KAWAKAMI, 2019).



According to Fischer (2016) apud Silva and Kawakame (2019), Industry 4.0 can anticipate unexpected events within a company, such as variations in demand or even necessary maintenance of equipment, aiming to improve the self-management capacity of companies.

Corroborates this conception Santos (2018), defining Industry 4.0 as the representation of the fourth Industrial Revolution, this being the evolution for cyber-physical systems, that is, the connection between physical industrial assets and digital technologies so that it is possible to leverage information systems by transferring autonomy and autonomous decisions to cyber-physical systems and machines.

Based on the perception that Logistics 4.0, derived from Industry 4.0, it can be said that this is a new phase of logistics that seeks intelligent connections to meet speed requirements, gain efficiency, and cost reduction in an improved way. It emphasizes the improvement of decision-making based on data that is produced within each company, and some exchanges between customers, carriers, and everyone involved in the logistics chain (MUNDO LOGÍSTICA, 2020).

The emergence of Information Technologies (IT) within Logistics 4.0 has led to the emergence of new management concepts to be considered in the logistics sector, such as the importance of the interaction of machines and equipment with man, through internet connectivity, because, with this, many positive results have been seen. Based on this assumption, logistics is considered one of the pillars of the value chain, since this new phase of logistics emerges as a tool for significant improvements and changes (PACHECO; REIS, 2019).

Thinking of Industry 4.0 from which Logistics 4.0 derives, it follows a trend to abandon mass production and adopt mass customization, that is, the production of more dynamic and intelligent goods or services, which at a reduced cost can meet specific and individual requirements, and for this to be possible, great flexibility and agility of the company are necessary (MATOS, 2018).

According to Maplink (2019), logistics 4.0 has the idea of using the logistics operation to connect machines and carriers to employees, so that consequently companies no longer depend on large centers, attributing more efficiency, quality, and agility in delivery times in whole supply chain.

Based on the concepts of logistics 4.0, its main characteristics are reduction of inventories; short lead-time, that is, reduction in production time until the delivery of the item to the final customer; highly connected processes; real-time information; virtual monitoring of processes and operations; integrated view of the supply chain (MAPLINK, 2019).

The term “Logistics 4.0” has become more popular in recent times, is derived from the Fourth Industrial Revolution, has a close relationship with the use of cyber-physical systems that are capable of performing self-diagnosis, self-configuration among others, through cutting-edge technologies (CAVALCANTE et al, 2019). The main of these technologies are: Artificial Intelligence (AI), Internet of

Things (IoT), and are part of the so-called Digital Transformation, a concept that unites the use of information and communication technology, acting as a predominant element to transform and reconfigure elements organizational (MENDONÇA; ANDRADE; NETO, 2018)

### 2.3 LOGISTIC TOOLS 4.0

According to Almeida et al (2019), it can summarize the concept of Logistics 4.0 by improving ancestral logistics, and which now has a proposal for more technological investments, so that technology is the greatest ally of organizational growth, contributing to the automation of processes and consequently to increase productivity and efficiency in operations, being possible through solutions such as Big Data, AI - Artificial Intelligence, Internet of Things and Blockchain.

#### 2.3.1 *Big Data*

The term Big Data can be defined as a large set of data capable of being captured, communicated, aggregated, analyzed, and stored, and which are part of the global economy and all its sectors, bringing a wide range of data and sources that consequently requires to see things in a new way (CLÁUDIO; MALDONADO, 2019). Also, it provides the integration of several devices that promote the use of a large processing potential, since, when connected to the network, they collect, store and exchange large flows of information. Therefore, Big Data has a fundamental role in the digitalized world, as it also acts in the quality and speed in the transformation of information, increasing the learning of machines, processes and in the innovation stages of companies (MATOS, 2018).

Still according to Matos (2018), in the whole context of connection and virtual integration, it must be said that data processing is of paramount importance for the improvement of industrial activity, to improve the dynamics of production activities and thereby increase efficiency and productivity, and it is only possible through Big Data, where data is accessed, analyzed and implemented by digital factories. It is also possible to observe a contribution in reducing product delivery time, increasing the level of service offered to the customer, and reducing inventory and operating costs. The term Big Data can be defined as a large set of data capable of being captured, communicated, aggregated, analyzed, and stored, and which are part of the global economy and all its sectors, bringing a wide range of data and sources that consequently requires to see things in a new way (CLÁUDIO; MALDONADO, 2019). Besides, it provides the integration of several devices that promote the use of a large processing potential, since, when connected to the network, they collect, store and exchange large flows of information. Therefore, Big Data has a fundamental role in the digitalized world, as it also acts in the quality and speed in the



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### **2.3.2 Artificial intelligence – AI**

Artificial Intelligence (AI), represents an intelligence equivalent to human, being through software or mechanisms, and that the main researchers in this field also define as the design and study of intelligent agents, that their system makes possible greater chances of success because it perceives its environment and takes right actions. In addition to this conception, AI can also be defined as the study in the field of computer science that focuses on operations performed by computers, having as the main objective, to operate functions that if they were executed by a human being, they would be considered intelligent, that is, they have reasoning ability, learn from mistakes and successes to act more effectively in the future, recognize visual, sensory and behavior patterns, and can apply all this reasoning in everyday situations (ALMEIDA et al, 2019).

Due to the possibility of AI developing human skills and competencies, discussions are taking place on this subject. One of the processes used by AI is in software for driving cars and controlling the financial market. With this, it can contribute to the increase in processing capacity and enable communication between various devices connected to different services and online operations, and also, it makes it possible to improve the organization and communication capacity, contributing to the improvement of processes to increase the possibility of bringing the virtual world to the real (MATOS, 2018).

### **2.3.3 Internet of Things**

The Internet of Things, from the English Internet of Things (IoT), arose from the advances in several areas such as embedded systems, microelectronics, communication, and sensing, and can be conceptualized as an extension of the current Internet that provides Internet connection to objects that have computational capacity and communication of our day-to-day, such as smartphones, automobiles, home appliances, among others, in other words, the Internet of Things refers to the integration of physical

and virtual objects in networks that are connected to the Internet, allowing the exchange, collection, and storage of data that will be processed and analyzed, generating information and services on a large scale (FREITAS, 2017).

Since IoT relates the ability to sense, collect, transmit, analyze and distribute data on a large scale, with the way people process information, it ends up becoming essential to human progress, because with that the human being can obtain the knowledge necessary to survive and develop for a long time (EVANS, 2011). Combining all the facilities that the IoT provides when modifying equipment and creating programs, it is possible to proliferate computational solutions that facilitate the design and construction of new computers, programs, and components that are much more powerful than the previous ones, which makes it essential to keep the technological development offered by the Internet of Things approach constantly accelerating (ALMEIDA et al, 2019).

Concerning the IoT's field of action, several applications can be cited in different areas, such as industry, financial sector, agriculture, logistics/supply chain, transportation, public and private security, civil construction, energy, among others. This is because it is a technology under development that influences the emergence of new competencies in organizations and new data, in addition to providing essential computational resources to enable the creation of innovative applications, and at the same time make the IoT more operational (MENDONÇA; ANDRADE; NETO, 2018)

#### **2.3.4 Blockchain**

Currently, it is seen that the economic, legal, and political system is formed by contracts and transaction records, establishing limits, protecting assets, among other things, and for this to happen integrally, Blockchain technology is used, which is considered a great “Ledger” behind the digital currency called Bitcoin.

This technology is characterized as an open-source database to store information related to transactions, making them not need a third party to be executed, but only the trust distributed based on a Blockchain network. technology provides several possibilities to improve the appearance of the supply chain (CORRÊA, 2019). The potential of Blockchain has been observed by banks and corporations that are initiating studies about this technology, directed to the characteristic that it has to enable more security in financial transactions and without the intervention of third parties, what is called “smart contracts”, with this is seen the ability that Blockchain technology to transform the financial service, due to its computational complexity already used for other purposes (LIMA; HITOMI; OLIVEIRA, 2018).

Within the financial industry, some Blockchain applications have stood out for the benefits they provide, such as the HyperledgerFabric platform that makes it possible to use security information from

customers' mobile devices concerning the bank, so that through an anti-fraud system it is possible to verify if a cell phone was lost, stolen or stolen. Another application would be the PIER platform (Regulatory Entities Information Integration Platform), which allows data exchange with the financial system and its regulatory bodies (MIRANDA, ZUCHI, 2018).

Also according to Miranda and Zuchi (2018), a Blockchain application that is under development, but is also of great relevance, it is called SFD (Digital Financial System), this system works 24 hours a day, to provide the user with secure transfers, just selecting a contact from your phonebook, thus making it an alternative to transfers via DOC (credit document) or via TED (electronic transfer available), as both only work on weekdays. This innovation is bringing great expectations to the creation of a fast Blockchain-based payment order and bank transfer system in the financial industry.

### 3 METHODOLOGICAL PROCEDURES

The present study is structured in a qualitative approach of an exploratory nature, classified in bibliographic research as to the technical procedures, for being the most viable model to achieve the research purpose. According to Perovano (2016), qualitative research is that which refers to the way the collected data will be treated, when explanations, observations, and description of terms and concepts are made.

According to Severino (2017), the bibliography is a search made through available records, resulting from previous research, in documents, such as books, articles, theses, etc., which end up becoming sources of the topic being studied. researched, so that the researcher can work from studies and contributions of other authors.

The data were collected through a bibliographic search on the platform of the Mundo Logística Magazine, referring to the contents treated in the scientific articles that discuss Logistics 4.0 in different types of organizations. The data were searched using the keyword: logistics 4.0.

In the present study, the selection and research of articles was carried out on the platform of the Mundo Logística Magazine, since it was possible to obtain greater availability of articles with practical cases of application of logistics 4.0 in companies. For that, they were used as a keyword "logistics 4.0", because through this word it was possible to refine the search so that the results that meet the purpose of the search were found. In the research, the filter "all words" was used, because in this way it was possible to cover a larger number of results related to the subject addressed. In Table 01, the nine articles used in the research are presented.

Table 1: Articles researched on the portal Mundo Logística magazine.

ARTICLE TITLES	BIBLIOGRAPHICAL SOURCES
<b>Artigo 1</b> - Logistics in the 4.0 era	CUNHA, S. Logistic in the 4.0 era. <b>Mundo Logística Magazine</b> – online, 2019. Available at: < <a href="https://revistamundologistica.com.br/servlet/LeArtigo?artigo=70_logera40.pdf">https://revistamundologistica.com.br/servlet/LeArtigo?artigo=70_logera40.pdf</a> >. Access in: 11/01/2020
<b>Artigo 2</b> - Logistics 4.0: In practice	LOGÍSTICA, M. Logistic 4.0: In Practice. <b>Mundo Logística Magazine</b> – online, 2017. Available at: < <a href="https://revistamundologistica.com.br/servlet/LeArtigo?artigo=59_logistica40.pdf">https://revistamundologistica.com.br/servlet/LeArtigo?artigo=59_logistica40.pdf</a> >. Access in: 11/03/2020
<b>Artigo 3</b> - Logistic 4.0: A new challenge for the Brazilian logistics professional	DIAS JR, L. G. S. Logistic 4.0: A new challenge for the Brazilian logistics professional. <b>Mundo Logística Magazine</b> – online, 2018. Available at: < <a href="https://revistamundologistica.com.br/servlet/LeArtigo?artigo=66_logistica40.pdf">https://revistamundologistica.com.br/servlet/LeArtigo?artigo=66_logistica40.pdf</a> >. Access in: 11/03/2020
<b>Artigo 4</b> - Logistic 4.0: Technology and operations more united than ever	ROSSI, M. C. Logistic 4.0: Technology and operations more united than ever. <b>Mundo Logística Magazine</b> – online, 2017. Available at: < <a href="https://revistamundologistica.com.br/servlet/LeArtigo?artigo=58_logistica40.pdf">https://revistamundologistica.com.br/servlet/LeArtigo?artigo=58_logistica40.pdf</a> >. Access in: 11/10/2020
<b>Artigo 5</b> - Launches that will innovate logistics	LEITE, A. de S. Launches that will innovate logistics in 2020. <b>Mundo Logística Magazine</b> – online, 2020. Available at: < <a href="https://revistamundologistica.com.br/servlet/LeArtigo?artigo=75_materialancamentos.pdf">https://revistamundologistica.com.br/servlet/LeArtigo?artigo=75_materialancamentos.pdf</a> >. Access in: 11/10/2020
<b>Artigo 6</b> - Last mile: the final frontier	GUARNIERI, M.; ARAÚJO, R.; QUEIROZ, C. Last mile The final frontier. <b>Mundo Logística Magazine</b> – online, 2018. Available at: < <a href="https://revistamundologistica.com.br/servlet/LeArtigo?artigo=64_ultimamilha.pdf">https://revistamundologistica.com.br/servlet/LeArtigo?artigo=64_ultimamilha.pdf</a> >. Access in: 11/16/2020
<b>Artigo 7</b> - Technology applied in Logistics	LOGÍSTICA, M. Technology applied to Logistics. <b>Mundo Logística Magazine</b> – online, 2018. Available at: < <a href="https://revistamundologistica.com.br/servlet/LeArtigo?artigo=64_tecnologialogistica.pdf">https://revistamundologistica.com.br/servlet/LeArtigo?artigo=64_tecnologialogistica.pdf</a> >. Access in: 11/22/2020
<b>Artigo 8</b> - Artificial intelligence in the supply chain	BLANCO, AP. Artificial intelligence in the supply chain. <b>Mundo Logística Magazine</b> – online, 2019. Available at: < <a href="https://revistamundologistica.com.br/servlet/LeArtigo?artigo=68_IA.pdf">https://revistamundologistica.com.br/servlet/LeArtigo?artigo=68_IA.pdf</a> >. Access in: 11/26/2020
<b>Artigo 9</b> - The use of IoT in the blockchain for product traceability in supply chains	BOSCHI, A. A.; BATOCCHIO, A. The use of IoT in the blockchain for product traceability in supply chains. <b>Mundo Logística Magazine</b> – online, 2019. Available at: < <a href="https://revistamundologistica.com.br/servlet/LeArtigo?artigo=71_IoT.pdf">https://revistamundologistica.com.br/servlet/LeArtigo?artigo=71_IoT.pdf</a> >. Access in: 11/29/2020

With regard to data analysis, a content analysis was carried out, which, according to Severino (2017), is conceptualized as a methodology for analyzing and studying information in a document, in the form of written, oral speeches, images, among others, that is, it seeks a critical understanding of the meaning of communications, be it manifest or hidden.

#### 4 ANALYSIS OF RESULTS

Based on Logistics Technologies 4.0 implemented in organizations, it was possible to identify the different types of technologies, which were implemented in companies, which will be presented in this topic.

Logistics professionals have a high degree of relevance to business success, as they are responsible for maintaining customer/consumer satisfaction, through the level of service provided. Maintaining a high

level of customer service means investing in maintaining the efficiency of the team of professionals working in logistics, as it is a critical function in companies and, therefore, such professionals have a significant impact on the success of the business (DONATO, 2010).

As mentioned by Fávero (2018) apud Mundo Logística Magazine (2018), CEO of Everlog Brasil, the organization is completely aligned with the concept of Logistics 4.0. . "To increase efficiency in freight auditing and the control tower, the company uses AI, big data, and robotization, optimizing daily tasks, such as communication with carriers and log analysis. Also, the company has a tool focused on shippers, having the powerful big data tool, which allows the exchange of information in real-time, generating market intelligence for customers. The carrier selection process is the main resource in line with Logistics 4.0, empowering industries to choose the best transport option for each type of shipment. The solution will bring decision power to the shipper and greater visibility, as it allows the analysis of online freight indicators from any device connected to the internet."

According to Abad (2018) apud Mundo Logística Magazine (2018), Logistic 4.0 is also at the focus of Globalstar, which has directed a large part of its resources in IoT, to meet the growing demands. The company created the SmartOne line, with satellite trackers, for mobile or fixed assets, which in addition to informing the position, accept signals from external sources, making these devices excellent options for the efficient management of remote assets.

The adoption of Internet of Things (IoT), Artificial Intelligence (AI), and Big data technologies, in addition to equipment aligned with these innovations, demonstrate an even more challenging horizon for operations professionals, who, at present, in addition to the various skills already inherent to their professional environment, they will also need to further develop a holistic view of their operations (DIAS JR, 2018).

*Artificial Intelligence in logistics has a fundamental role in the management of risks and costs of operations, either by minimizing operating expenses or enabling a broader view of the supply chain (BLANCO, 2019).*

According to Blanco (2019) apud Mundo Logística Magazine (2019), the use of Artificial Intelligence in logistics has provided a true digital transformation in the sector, from the development of automated equipment and machinery to intelligent systems and platforms for management. Artificial intelligence enables highly integrated management between suppliers and points of sale, from the management of flows, data, and information, to the real-time monitoring of each operation. All at a global level, regardless of the complexity or size of the operation, which may include different modes of transport, delivery regimes, specificities, and characteristics of the demands.

According to Klein (2018) apud Mundo Logística (2018), referring to the company RotaExata, which uses the Big data tool with only one objective, which is to extract concise data, helping companies to generate value, and real results in their operations. field. “For him, the company's hardware has two communication technologies, the Global System for Mobile Communications and digital wireless data communication, which enable greater signal capacity and security for eventual cases. The field activity is carried out by all vehicles of the company. Be it a collection, delivery, visit, or service. Thus, to meet a specific demand, there may be a specific type of operation for each vehicle”.

According to the research conducted, it is clear that companies are using Logistics 4.0 to seek improvement and improvement of their processes, as according to Maplink (2019), Logistics 4.0 uses highly connected processes, reduces inventories and time production to delivery of the item to the end customer, provides real-time information, in addition to virtually monitoring processes and operations, offering an integrated view of the supply chain. For this to be possible, companies use the tools of logistics 4.0, which are fundamental due to the benefits brought to the processes carried out in the business sectors.

Still, in addition to the findings, according to Almeida et al (2019), the proposal to use the tools of Logistics is for there to be more technological investments, making technology the greatest ally of organizational growth, using resources such as Big Data, IA - Artificial Intelligence, Internet of Things and Blockchain, which can automate processes and consequently increase the productivity and efficiency of operations, in addition to benefiting both workers and consumers of services and products.

#### 4.1 THE CHANGE PROCESS AND THE BENEFITS OF LOGISTICS 4.0

From the research carried out in the articles, it was possible to identify the changes and benefits that logistics 4.0 provides to companies that use logistics 4.0 and the tools implemented by it. Therefore, this topic brings a little about this process, explaining how these resources have been causing positive impacts on the daily lives of companies and the results of services offered to their customers.

It should be added that Logistics 4.0 is no longer a prospect, it is a reality and is being used now. The fact is that there is a transformation in which the customer is the engine of activities (FAVERO, 2018).

The insertion of technologies and technological devices, in the context of manufacturing operations, brought a new concept of work to the areas of logistics and Supply Chain. For Donato (2010), the changes resulting from industry 4.0 promoted a new historic moment, within the logistics scenario in Brazil. The changes, in certain areas of operations, went beyond the redesign of work or material flow or, still, the adoption of new management techniques in production and operations. In certain situations, the



change affected the entire organizational culture, thus changing the *raison d'être* and the strategic focus of these organizations.

Adhering to a new work methodology, with the inclusion of Logistics 4.0 concepts in organizations that aim to modernize their operations, results in yet another challenge for professionals in the area of logistics and supply chain management. According to Dias Jr (2018), the challenge persists not only in understanding what changes logistics 4.0 brings to the organizational market environment, but also in how to use these changes in favor of the company's competitive advantage, adding even more value to the process and, with this, generating more positive results for the company.

Gorodovits (2012) apud Mundo Logística Magazine (2018), director of the company GKO Computing, states that through Artificial Intelligence, it is possible to automate processes quickly and effectively, performing tasks such as message interpretation, anomaly detection, and others, aiming to mitigate human failures, especially when activities are involved with large amounts of data. AI use is already leveraged for intelligent cargo choices for joint shipments, formatting them to avoid unnecessary splitting and thereby reducing costs. The insertion of AI in the company led to a 25% reduction in the cost of freight and a 30% reduction in inquiries about the cargo position.

There are many benefits of Logistics 4.0 to the market, including loss reduction, since, knowing more about the products, better solutions are planned, avoiding losses with damages and losses, the improvement of the analysis of data, since, with the latest technology, results are enhanced, optimizing processes and creating more effective strategies; between others. *However, as the concept is based on increasing integration, through connectivity, and for the process to fully benefit, a change in the organizational culture must be promoted. People need to be prepared for changes in the execution and monitoring of processes. This may be the biggest challenge to be faced (BLANCO, 2019).*

It is visible that Logistics provides many benefits for companies, from a greater focus on business strategy through the combination of resources and services, to cost reduction through the reduction of manual work and greater automation of services, thus leading to an increase customer satisfaction, in addition to a significant gain in the quality of products and services, making the company stand out from the competition (ALMEIDA, 2019).

According to Pacheco and Reis (2019), logistics 4.0 could be considered one of the pillars of the value chain due to its significant changes and improvements brought to the business environment, because through the Information Technologies (IT) it was possible the emergence of new management concepts to be taken into account by the logistics sector, bringing many positive results, through the interaction of equipment with the moment through internet connectivity, thus reducing costs in an improved way and gaining more efficiency in all services and processes that are part of the service branch.

According to the research carried out, it was noticed that companies are increasingly using the tools of Logistics 4.0, as their insertion has been generating positive and satisfactory results. It is seen that companies need to adapt more and more to the changes and modernities of technologies, so that it is possible to provide more efficient services, seeking to more fully meet the needs of their customers.

## 5 FINAL CONSIDERATIONS

The growing demand for improved data management and the need to create tangible values for customers indicate the need to use new digital technologies. From this, Logistics 4.0 tools were identified, such as Blockchain, Internet of things (IoT), Big data, and Artificial Intelligence (AI), and with its use, positive and necessary results were found for companies to become increasingly efficient.

Companies that adopt Logistics 4.0 tools report improvements in the processes that are taking advantage of these technologies. From this, it becomes possible to automate processes easily and effectively, performing tasks such as message interpretation and anomaly detection, aiming to mitigate failures and reduce losses. Knowing more about the products, better solutions are planned, avoiding losses, the improvement of data analysis since with the latest technology, the results are enhanced, optimizing the processes and creating more effective strategies. The focus on business strategy is considerably greater, through the combination of resources and services, up to cost reduction through the reduction of manual labor and greater automation of services. Thus, there is an increase in customer satisfaction, in addition to a significant gain in the quality of products and services, making the company stand out from the competition.

It can be said that a company that does not invest and adheres to new technologies, does not manage to become competitive, much less offer differentials and innovative experiences without this type of investment. Such digital transformation not only reflects a trend towards innovation and modernization in the sector but mainly a strategic and intelligent alternative for companies to stand out and promote increasingly advanced and efficient operations to their customers.

Logistics 4.0 is real, economically viable, and will quickly become dominant, driven by the forces of competitiveness, which command relentless natural selection, in the corporate world. With this, it can be observed that there are several benefits brought by Logistic 4.0, such as the reduction of failures, cost reduction, and greater automation of services. Companies that use their tools tend to have a greater gain in competitiveness, improving their data analysis, enhance their results and optimize their processes, showing that the use of Logistics 4.0 is of paramount importance for business development.

Through this research, it was possible to observe the insertion of new technologies brought by Logistic 4.0 and the positive results with the use of these tools in the business sector. Thinking that more

and more companies are looking for their growth and improvement of their processes, it would be of paramount importance for this area of research, an approach aimed at investigating which tools are providing greater results by segment, thus making possible a more detailed analysis of how and which tool would be most beneficial in each sector and all the processes that make up the same.

## REFERENCES

- ALMEIDA, F. A. S.; ROSA, A. C.; SANTOS, D. S. MORAES, J. G.; SANTOS NETO, S. T. INDÚSTRIA 4.0 e LOGÍSTICA 4.0: inovação, integração, soluções e benefícios reais decorrentes do mundo virtual. **Anais. XFATECLOG**, Garulhos – SP, 2019.
- AYRES, A. P. S. **Gestão de Logística e Operações**. Curitiba: IESDE Brasil S.A., 2009.
- BADER, M.; SAVOIA, J. R. F. Logística da distribuição bancária: tendências, oportunidades e fatores para inclusão financeira. **RAE-Revista de Administração de Empresas**. São Paulo, 2013.
- BALLOU, R. H. **Gerenciamento da Cadeia de Suprimentos/Logística Empresarial**. 5ª edição. Porto Alegre: Bookman, 2004.
- BECKER, J. L.; LUNARDI, G. L.; MAÇADA, A. C. G. **Análise de eficiência dos Bancos Brasileiros: um enfoque nos investimentos realizados em Tecnologia de Informação (TI)**. Prod. São Paulo, online, 2003.
- BOSCHI, A. A.; BATOCCHIO, A. O uso de IoT na *blockchain* para a rastreabilidade de produtos nas cadeias de suprimentos. **Revista Mundo Logística** – online, 2019.
- BLANCO, A. P. Inteligência artificial na cadeia de suprimentos. **Revista Mundo Logística** – online, 2019.
- CAVALCANTE, H. S. et al. Uma Breve Análise Sobre a Evolução da Logística. **Artigos. XVI Simpósio de Excelência em Gestão e Tecnologia**, 2019.
- CUNHA, S. A Logística na era 4.0. **Revista Mundo Logística** – online, 2019.
- DIAS JR, L. G. S. Logística 4.0: Um novo desafio ao profissional de logística brasileiro. **Revista Mundo Logística** – online, 2018.
- EVANS, D. A Internet das Coisas: Como a próxima evolução da Internet está mudando tudo. **Cisco Internet Business Solutions Group (IBSG)** – online, 2011.
- FRAGA, M. A. F.; FREITAS, M. M. B. C.; SOUZA, G. P. L. Logística 4.0: conceitos e aplicabilidade: uma pesquisa-ação em uma empresa de tecnologia para o mercado automobilístico. **Caderno PAIC** – online, 2016.
- FREITAS, A. de A. A Internet das Coisas e Seus Efeitos na Indústria 4.0. **MONOGRAFIA** – online, 2017.
- GONÇALVES, J. E. L. Os Impactos da Novas Tecnologias nas Empresas Prestadoras de Serviços. **Rev. adm. empres.**, São Paulo, 1994.
- GUARNIERI, M.; ARAÚJO, R.; QUEIROZ, C. Última milha – a fronteira final. **Revista Mundo Logística** – online, 2018.
- LEITE, A. de S. Lançamentos que irão inovar a logística em 2020. **Revista Mundo Logística** – online, 2020.

LIMA, B. H. N.; HITOMI, F. A. C.; OLIVEIRA, G. S. Aplicação da tecnologia blockchain em ambientes corporativos. **FaSci-Tech** – online, 2018.

LOGÍSTICA, M. Logística 4.0. **Revista Mundo Logística** – online, 2020.

LOGÍSTICA, M. Logística 4.0: Na prática. **Revista Mundo Logística** – online, 2017.

LOGÍSTICA, M. Tecnologia aplicada à Logística. **Revista Mundo Logística** – online, 2018.

MAGNUS, T. Transformação Digital nos bancos: evolução nos serviços financeiros. Artigo – online, 2018.

MAPLINK. Inteligência Artificial Aplicada à Logística 4.0. **MAPLINK** – online, 2018.

MENDONÇA, C. M. C., ANDRADE, A. M. V.; SOUSA NETO, M. V. Uso da IoT, Big Data e Inteligência Artificial nas Capacidades Dinâmicas. **Revista Pensamento Contemporâneo em Administração** – online, 2018.

MIRANDA, J. C.; ZUCHI, J. D. TECNOLOGIA BLOCKCHAIN: a disrupção na indústria financeira. **Revista Interface Tecnológica** – online, 2018.

PACHECO, T. R.; REIS, J. G. M. LOGÍSTICA 4.0: Uma Breve Revisão da Bibliográfica. **Anais. III Encontro Internacional de Gestão, Desenvolvimento e Inovação (EIGEDIN)**, Nivaraí – MS, 2019.

PEROVANO, D. G.; **Manual de metodologia da pesquisa científica**. 1ª edição. Curitiba: InterSaberes, 2016.

ROSSI, M. C. Logística 4.0: Tecnologia e operações mais unidas do que nunca. **Revista Mundo Logística** – online, 2017.

SEVERINO, A. J. **Metodologia do Trabalho Científico**. 24ª edição. São Paulo: Cortez, 2017.

SILVA, D. A. G. da. Indústria 4.0 Com Foco Nos Sistemas Cyber Físicos. **MONOGRAFIA** – online, 2018.

SILVA, E. F. S.; KAWAKAME, M. S. Logística 4.0: Desafios e inovações. **Anais. IX Congresso Brasileiro de Engenharia de Produção**, Ponta Grossa – PR, 2019.

TACHIZAWA, T.; POZO, H.; FURLANETI, E. Atendimento Bancário Digital: estudo de caso em microempresas. **Revista Ciências Sociais em Perspectiva** – online, 2017.

TARCHETTI, O. P. Análise Comparativa de Processos Logísticos no Setor de Serviços. **MONOGRAFIA** – online, 2010.