

FROM STORAGE TO E-LOGISTICS: LOGISTICS SERVICES AND THEIR APPLICATION IN THE TEXTILE AND APPAREL INDUSTRY

DA ARMAZENAGEM À E-LOGÍSTICA: SERVIÇOS LOGÍSTICOS E SUA APLICAÇÃO NA INDÚSTRIA TÊXTIL E DE CONFECÇÃO

DEL ALMACENAMIENTO A LA LOGÍSTICA ELECTRÓNICA: SERVICIOS LOGÍSTICOS Y SU APLICACIÓN EN LA INDUSTRIA TEXTIL Y DE LA CONFECCIÓN

 <https://doi.org/10.56238/sevened2025.036-007>

Diego Milnitz¹, Monica Maria Mendes Luna²

ABSTRACT

Logistics plays a strategic role in the competitiveness of supply chains, especially in global sectors such as textiles and apparel, which face growing demands for efficiency, traceability, customization, and sustainability. In this context, logistics services are becoming increasingly important not only as operational support but also as instruments of differentiation and value creation. This article aims to analyze, through a structured literature review, the main types of logistics services available and their potential applications in the textile and apparel industry. The research was conducted using Scopus and Web of Science databases, using analysis and selection procedures that resulted in a portfolio of 20 core articles. The results indicate that, in addition to the traditional areas of storage and transportation, there is an expansion of value-added services such as customer support, information technology, security, and e-logistics. The growing role of outsourcing was also highlighted, allowing companies to focus on strategic activities and establish more collaborative partnerships throughout the supply chain. The analysis reveals that the integration of logistics services and collaborative practices enhances competitiveness and resilience gains, but also highlights gaps in performance measurement and the incorporation of green and digital practices. As a contribution, the study provides an integrated view of logistics services, highlighting their importance for strengthening the textile and apparel supply chain and signaling opportunities for future research on emerging topics such as sustainability, Logistics 4.0, and the circular economy.

Keywords: Logistics Services. Textile and Apparel Industry. Supply Chain. Outsourcing. E-Logistics.

RESUMO

A logística desempenha papel estratégico na competitividade das cadeias de suprimentos, especialmente em setores globais como o têxtil e de confecção, que enfrentam demandas crescentes por eficiência, rastreabilidade, personalização e sustentabilidade. Nesse contexto, os serviços logísticos assumem relevância não apenas como suporte operacional, mas também como instrumentos de diferenciação e geração de valor. Este artigo tem como objetivo analisar, por meio de uma revisão bibliográfica estruturada, os principais tipos de

¹ Dr. in Production Engineering. Universidade Federal do Paraná (UFPR). E-mail: dmilnitz@gmail.com

² Dr. in Production Engineering. Universidade Federal de Santa Catarina (UFSC).
E-mail: monica.luna@ufsc.br

serviços logísticos disponíveis e suas potenciais aplicações na indústria têxtil e de confecção. A pesquisa foi conduzida a partir das bases Scopus e Web of Science, utilizando procedimentos de análise e seleção que resultaram em um portfólio de 20 artigos centrais. Os resultados indicam que, além das áreas tradicionais de armazenagem e transporte, observa-se a expansão de serviços de valor agregado, como apoio ao cliente, tecnologia da informação, segurança e e-logística. Evidenciou-se ainda o papel crescente da terceirização, que permite às empresas focar em atividades estratégicas e estabelecer parcerias mais colaborativas ao longo da cadeia. A análise revela que a integração entre serviços logísticos e práticas colaborativas potencializa ganhos de competitividade e resiliência, mas também aponta lacunas quanto à mensuração de desempenho e incorporação de práticas verdes e digitais. Como contribuição, o estudo fornece uma visão integrada dos serviços logísticos, destacando sua importância para o fortalecimento da cadeia de suprimentos têxtil e de confecção e sinalizando oportunidades de pesquisa futura em temas emergentes como sustentabilidade, logística 4.0 e economia circular.

Palavras-chave: Serviços Logísticos. Indústria Têxtil e de Confecção. Cadeia de Suprimentos. Terceirização. E-Logística.

RESUMEN

La logística desempeña un papel estratégico en la competitividad de las cadenas de suministro, especialmente en sectores globales como el textil y la confección, que se enfrentan a crecientes demandas de eficiencia, trazabilidad, personalización y sostenibilidad. En este contexto, los servicios logísticos adquieren cada vez mayor importancia no solo como apoyo operativo, sino también como instrumentos de diferenciación y creación de valor. Este artículo busca analizar, mediante una revisión bibliográfica estructurada, los principales tipos de servicios logísticos disponibles y sus posibles aplicaciones en la industria textil y de la confección. La investigación se realizó utilizando las bases de datos Scopus y Web of Science, mediante procedimientos de análisis y selección que dieron como resultado una cartera de 20 artículos principales. Los resultados indican que, además de las áreas tradicionales de almacenamiento y transporte, existe una expansión de servicios de valor añadido como la atención al cliente, las tecnologías de la información, la seguridad y la logística electrónica. También se destacó el creciente papel de la externalización, que permite a las empresas centrarse en actividades estratégicas y establecer alianzas más colaborativas a lo largo de la cadena de suministro. El análisis revela que la integración de servicios logísticos y prácticas colaborativas mejora la competitividad y la resiliencia, pero también destaca las deficiencias en la medición del rendimiento y la incorporación de prácticas ecológicas y digitales. Como contribución, el estudio ofrece una visión integral de los servicios logísticos, destacando su importancia para fortalecer la cadena de suministro textil y de la confección y señalando oportunidades para futuras investigaciones en temas emergentes como la sostenibilidad, la Logística 4.0 y la economía circular.

Palabras clave: Servicios Logísticos. Industria Textil y de la Confección. Cadena de Suministro. Subcontratación. Logística Electrónica.

1 INTRODUCTION

There are a number of changes that have taken place in the textile and apparel industry in relation to its functions, activities, and strategies. For example, demand and supply are no longer restricted to nations or regions, they have become global processes (ERYURUK; KALAOĞLU; BASKAK, 2011). In addition, product assortments have expanded significantly and market demands on product quality, traceability, delivery services and sustainability continue to increase (HSIAO *et al.*, 2010). One of the innovations in logistics is to specialize in its core activities and outsource non-essential activities to service providers. Outsourcing is an elegant way to solve organizational problems, in the literature there are numerous reports of its growing use (ANDERSSON and NORRMAN, 2002).

Most publications on logistics services discuss the use of traditional logistics processes, such as transportation and warehousing (DAIM; UDBYE; BALASUBRAMANIAN, 2012; VAN LAARHOVEN; BERGLUND; PETERS, 2000; STEFANSSON, 2006), advantages and risks of outsourcing (RAZZAQUE and SHENG, 1998; NOREK and POHLEN, 2001; SOHAIL and SOHAL, 2003), or the service provider selection process (DAIM; UDBYE; BALASUBRAMANIAN, 2012; AGHAZADEH, 2003). However, very little is known about the various types of logistics services that exist, whether basic or value-added, that involve logistics planning and control activities specifically in the textile and apparel supply chain.

In this sense, this article aims to analyze, through a theoretical study about logistics services, which are possible to be explored by the textile and apparel industry. As it is an updated literature review, the study tends to present a vision of the logistics service that is more integrated with the collaborative concepts of the supply chain. In this way, the structure and activities in the traditional areas of logistics, such as storage and transport, as well as in the areas that have been incorporated in recent years, such as customer service, information technology, safety and security, and e-logistics, are discussed.

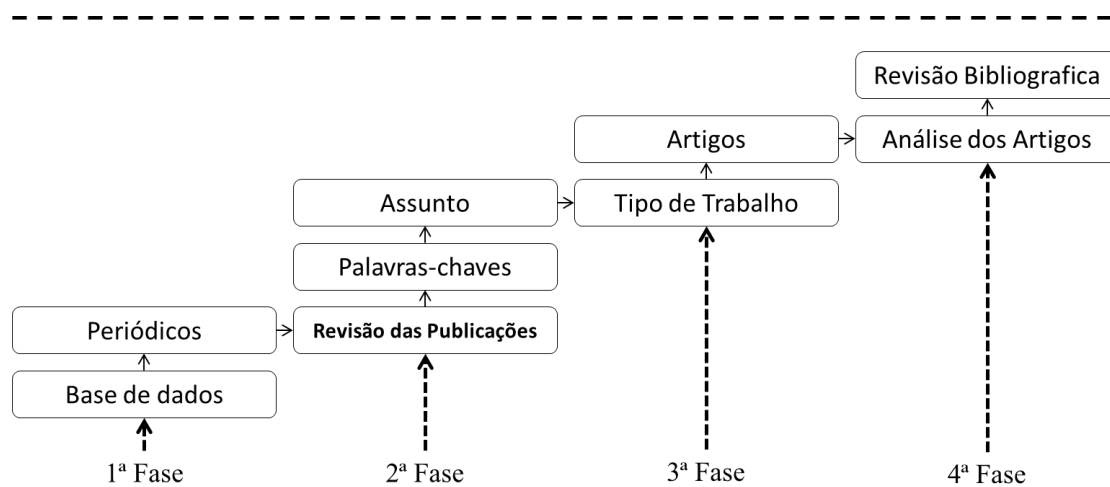
For this, this work was divided into five sections, in addition to this brief introduction, there is section two that presents the methodological procedures, section three discusses logistics services in the textile and apparel industry, section four presents the types of logistics services offered and, finally, in section five, the final considerations of the article and some recommendations for future research are made.

2 METHODOLOGICAL PROCEDURES

This research can be considered conceptual theoretical, focused on the bibliographic analysis to be carried out through a structured literature review (MARASCO, 2008), with the objective of analyzing the theme of logistics service. To this end, the literature review method with four different phases will be used, as illustrated in Figure 1.

Figure 1

FlowTable of the Methodology to be applied in the research



Source: Based on the methodology employed by Marasco (2008).

2.1 PHASE 1: DEFINITION OF DATABASES AND JOURNALS

In the first phase for the composition of the bibliographic portfolio, the *Web of Science* and *Scopus* databases were defined. The choice of the *Scopus database* is due to the fact that it encompasses the journals that publish the most in Production Engineering and Logistics (MARASCO, 2008). In the case of choosing *the Web of Science*, it is due to the fact that the main journals in the area of Production Engineering are indexed.

The research was carried out by searching for publications in journals without time limit to verify the evolution of the theme over the years. The total number of papers found in these databases was the result of searching for the researched theme in the titles, abstracts and keywords of the articles.

2.2 2ND PHASE: DEFINITION OF KEYWORDS AND READING OF ABSTRACTS

In the second phase, the following keywords were defined for the literature review: "*Logistics and Service*".

The works found with this combination of keywords were mostly book chapters, standards, conference papers, among others, giving a total of 3,107 works. However, the present research focused on international articles, with the aim of giving greater credibility and also delimiting the research. Thus, in the two journals researched, 1,469 articles were obtained.

2.3 3RD PHASE: SELECTION OF ARTICLES

After reading the titles of the 1,469 articles, only the articles that had a strong relationship with the logistics service were selected, thus accounting for 243 publications in the *Scopus and Web of Science databases*.

Another filter used to verify the scientific relevance of the articles was the number of citations, which was used as a criterion for their permanence in the research publication database. The search for this criterion was carried out with the help of the *Google Scholar tool*, which presents the number of citations of each article through the title of the article. Finally, the abstracts, introduction, and conclusions of the articles were read. Of the 243 articles, only 20 were aligned with the two research themes, and were selected for full reading, as illustrated in Table 1.

Table 1

Selected articles in the bibliographic portfolio

N o.	Authors	Article Title	Year of Publication	No. of Citations
1	Aghazadeh	How to choose an effective third party logistics provider.	2003	106
2	Alkhatib; Darlington; Nguyen	Logistics Service Providers (LSPs) evaluation and selection: Literature review and framework development.	2015	1
3	Andersson; Norrman	Procurement of logistics services - a minutes work or a multi-year project?	2002	239
4	Caputo; Pelagagge; Scacchia	Integrating Transport Systems in Supply Chain Management Software Tools.	2003	42
5	Chapman; Soosay; Kandampully	Innovation in logistic services and the new business model: a conceptual framework.	2003	361
6	Daim; Udbye; Balasubramanian	Use of analytic hierarchy process (AHP) for selection of 3PL providers.	2012	23
7	Eryuruk; Kalaoğlu; Baskak	Logistics as a Competitive Strategy Analysis of the Clothing Industry in Terms of Logistics.	2011	9

8	Esper; Williams	The Value of Collaborative Transportations Management (CTM): Its Relationship to CPFR and Information Technology.	2003	187
9	Griffis; Cooper; Goldsby; Closs	Performance measurement: measure selection based upon firm goals and information reporting needs.	2004	85
10	Hendricks; Singhal	The effect of supply chain glitches on shareholder wealth.	2003	627
11	Hsiao; Van der Vorst; Kemp; Omta	Developing a decision-making framework for levels of logistics outsourcing in food supply chain networks.	2010	36
12	Jahre; Johan	Packages and physical distribution: implications for integration and standardisation.	2004	54
13	Knemeyer; Zinn; Eroglu	Proactive planning for catastrophic events in supply chains.	2009	240
14	Lieb	The 3PL industry: where it's been, where it's going.	2005	45
15	Morash; Lynch	Public policy and global supply chain capabilities and performance: a resource-based view.	2002	93
16	Ovalle; Marquez	The effectiveness of using e-collaboration tools in the supply chain: an assessment study with system dynamics.	2003	139
17	Patterson; Grimm; Corsi	Diffusion of supply chain technologies.	2004	72
18	Power; Sharafali; Bhakoo	Adding value through outsourcing: Contribution of 3PL services to customer performance.	2007	76
19	Stefansson	Collaborative logistics management and the role of third-party service providers.	2006	180
20	Van Laarhoven; Berglund; Peters	Third-party logistics in Europe-five years later.	2000	328

Source: Authors.

2.4 4TH PHASE: ANALYSIS OF ARTICLES

After the construction of the bibliographic portfolio, a literature review was carried out. From this analysis it was possible to understand the subject and build knowledge about the objective proposed for the research. The results of this review are presented in the following items of the article.

3 LOGISTICS SERVICES IN THE TEXTILE AND CLOTHING INDUSTRY

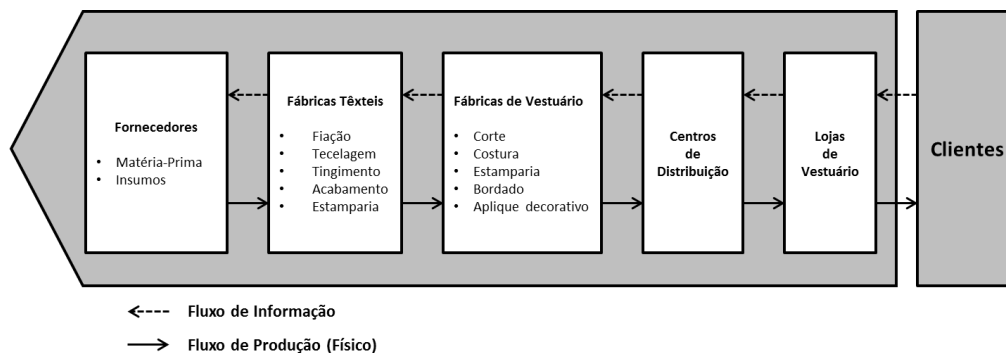
Logistics, in its basic definition, is the efficient flow and storage of goods from their point of origin to the point of consumption. It is the part of the process in the supply chain that plans, schedules, and controls the flow of goods. It can also be seen as inventory management, of products in stock or in motion (ERYURUK; KALAOGLU; BASKAK, 2011). It is also defined as a business planning framework for the management of materials, services, information, and capital flows. It includes the increasingly complex information,

communication, and control systems required in today's business environment (ERYURUK; KALAOGLU; BASKAK, 2011).

The textile and apparel sector can be seen as a supply chain that encompasses a series of distinct activities, such as the supply of raw materials and inputs, the development of products and their production, distribution, and marketing. Figure 2 shows an illustration of this chain, with the dotted lines representing the flow of information, while the solid lines represent the flow of goods. Information flows from the customer providing production needs and delivery dates. In many cases, information flows directly from retailers to textile mills. The links that manufacture the product are formed by several companies that, in order to produce goods and services that make the information flow smoothly, need a series of logistical and business services. Depending on the size of the companies and the development of the economy, such services may be provided by the leading company in the supply chain or by service providers (ABERNATHY *et al.*, 1999).

Figure 2

Supply chain in the textile and apparel sector



Source: Adapted from Abernathy *et al.*, 1999.

Currently, large textile and apparel companies use logistics as a globalization strategy and have been outsourcing some operations, such as *inbound* and *outbound* logistics, which can be carried out at any stage of the chain. In addition, some processes in the apparel industry have also been outsourced, such as inventory and inventory management, repairs, stain removal, quality control, reprinting, counting, barcode application, labeling, packaging, placement of accessories, manuals and warranty documents, separation and classification of products, order management and assembly of product sets.

As a result, companies have obtained important advantages, such as time and cost reductions, being able to focus on their strategic activities in a more professional way.

4 TYPES OF LOGISTICS SERVICES

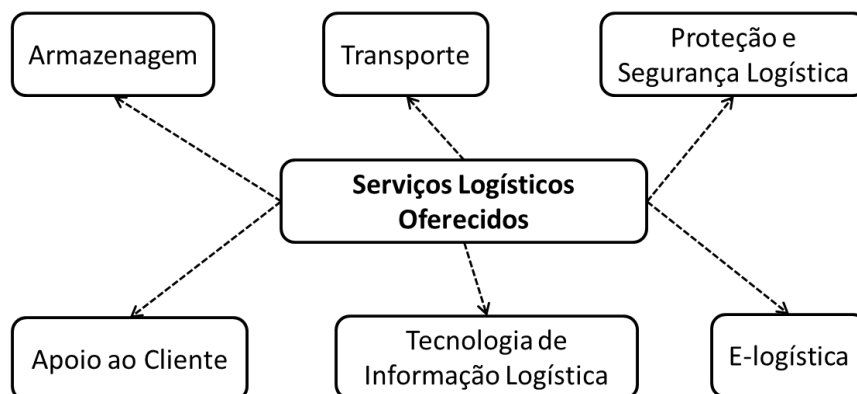
Logistics service can be called any activity that supports the processes of purchase, manufacture, sale, distribution and marketing, and they are generally outsourced because they do not constitute activities that are the company's business, in addition to collaborating to reduce costs, investments, obtaining expertise, etc. (LIEB, 2005; STEFANSSON, 2006).

Over time, many activities have been incorporated by logistics service providers, promoting the consolidation of partnerships. With this, it was possible to structure logistics services as an integral part of the client's business (GRIFFIS *et al.*, 2004).

In view of the literature review carried out, it was possible to elucidate several types of services that make up the logistics portfolio. These services can be divided into the most basic ones linked to the needs of moving products and their storage, as well as those with higher added value, which provide an appreciation of the product in relation to the logistical aspects involved. In each service category there is a series of specific activities and processes that complete its portfolio. Figure 3 presents a summary of the types of logistics services available in the market today.

Figure 3

Structure of Logistics Services available for Supply Chain



Source: Authors.

In the next items of the study, the details of each service are presented along with its specific portfolio. In addition, in each item, the possibilities of using these services by textile and clothing companies are presented and how this impacts the performance of the chain as a whole.

4.1 WAREHOUSING SERVICES

Inventory management of raw materials and finished products is necessary in all activities of the textile and apparel supply chain to obtain adequate production cycles and to supply the services demanded by the market. The physical operation of inventory management is usually carried out by distribution centers or warehouses, whose main activities are: receiving, storage, inventory control, product separation and loading (GUIMARÃES, 2008).

In addition to the basic services that are linked to storage both in warehouses and distribution centers, there are some types of value-added services that can be contracted by companies such as: *Cross-Docking*, product assembly, quality testing, product preparation, packaging, labeling, product rework, *Recall*.

For example, it is common for clothing companies to outsource some production processes to reduce operating costs, so it could hire others that add value to the product along with the storage service, passing on to the outsourced the responsibility for quality tests on the products received, labeling, packaging of products and availability in stock. As this type of service is usually hired in strategic locations as a way to speed up deliveries and reduce transportation costs, it is also possible to transfer steps in the after-sales process, such as rework and *recall*. Thus, administrative activities related to complaints and the rework or exchange of products could also be carried out.

Table 2 shows a summary of the main value-added activities and services that are related to warehousing.

Table 2

Types of logistics storage services offered by outsourcing companies

Basic Services in Warehousing		
	Description of Service Activities	Authors

Type of Service Offered		Power; Sharafali; Bhakoo (2007)	Hsiao <i>et al.</i> (2010)	Aghazadeh (2003)	Van Laarhoven; Berglund; Peters (2000)	Daim; Udbye; Balasubramanian (2002)	Stefansson (2006)	Guimarães (2008)
Receipt of products	All products that are stored, whether in warehouses or Distribution Centers, go through a receiving process, which consists of checking product characteristics with pre-established information.					X		X
Product storage	It is the product stored for later shipment. It requires a specific technique to locate the products according to the characteristics of the product itself and the form of storage.	X	X		X	X	X	
Inventory Control	Some products are sent for storage and there they are tested according to criteria established by the manufacturer	X	X	X	X	X	X	X
Order Picking	It consists of the separation of products by order. There are several picking techniques depending on the product and the type of order.		X		X		X	X
Loading orders	It consists of the shipment of products for subsequent transport. The form of loading must suit the mode used for loading.			X	X			X
Value-Added Services in Warehousing								
Cross-Docking	The cargo arrives at the terminal in a consolidated way and is dispatched fractionally, without generating storage, there is only one passage. The process requires synchronization in the receiving and dispatch processes.						X	
Product assembly	It consists of the final formation of products that are assembled when the order is confirmed for dispatch.	X	X	X	X	X		
Quality Control	Some products are sent for storage and there they are tested according to criteria established by the manufacturer			X	X	X	X	
Product preparation	There are products that require specific formatting and packaging before being shipped, or even specific packaging for dispatch.	X	X				X	
Product Packaging	You receive the consolidated product and then pack it when it is sold (or the type of sale)		X	X			X	
Product labeling	According to the type of sale, there is personalized or specific labeling.		X	X	X		X	

Rework and Recall	Products that return and allow reuse can be worked on in warehouses or distribution centers, avoiding going back to the factories.			X			X	
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Source: Authors.

4.2 TRANSPORTATION SERVICES

The transportation service is one of the main logistics functions. In addition to representing the largest portion of logistics costs in most organizations, it plays a fundamental role in the performance of several dimensions of customer service. Even with the advancement of technologies, which allow the exchange of information in real time, transport continues to be fundamental to achieve the logistical objective: the right product, in the right quantity, at the right time, in the right place, at the lowest possible cost. With an increasingly demanding and globalized market, companies feel the need to find partners that ensure not only the entire logistics service, but also the transport service of their products at more affordable costs (GUIMARÃES, 2008).

In order to improve the performance of services, especially by speeding up deliveries, many companies have sought alternatives by increasing new transportation systems, such as the system of loading in standardized carts used for loading and unloading, or standard packaging that tends to facilitate operations. However, these systems must be well studied according to the needs of each chain and the involvement of its agents (JAHRE and JOHAN, 2004). Alternatives that involve the handling of cargo linked to transport, such as *merge-in-transit*, are also an option for seeking results and improving services (HSIAO *et al.*, 2010; STEFANSSON, 2006)

Another aspect that has transformed transportation services has been the use of management tools supported by software capable of analyzing distribution networks, synchronizing and simulating the best alternatives, in addition to providing agility to the system. Geographic location systems also support these services (CAPUTO *et al.*, 2003; ESPER and WILLIAMS, 2003). For the textile industry, this type of value-added service in transportation reduces the risk of theft in the transfer of product loads, especially the loading of yarns or fabrics on rolls.

An important point in transport services is the growing demand from the textile and apparel chain for value-added services. An example is the distribution of clothing items to some retail companies that require products to be delivered on hangers, with the customer's price and labels. This type of personalized service is usually carried out by the clothing

companies themselves, but it is a process that can clearly be absorbed by transport service providers.

Table 3 presents a summary of the main transport services offered by transport companies.

Table 3

Types of transport logistics services offered by outsourcing companies

Basic Services in Transportation								
Type of Service Offered	Description of Service Activities	Authors						
		Power; Sharafali; Bhakoo (2007)	Hsiao et al. (2010)	Aghazadeh (2003)	Van Laarhoven; Berglund; Peters	Daim; Udbye; Balasubramanian	Stefansson (2006)	Hannon (2005) Lieb (2005)
Transportation (Outbound)	It groups a series of storage, handling, order picking and loading functions, until the cargo is delivered. In a market view, it consists of delivering the product to the customer or point of sale.	X				X		X
Transportation (Inbound)	Its purpose is to search for the distribution or manufacturing product to be delivered to the manufacturing or assembly customer.	X						X
Merge-in-Transit	The main logic is to coordinate the meeting of several supplies or vehicles so that compounds in another vehicle can form the cargo planned for dispatch.				X			X
Transit-Point	It consists of sending consolidated loads in larger vehicles, which will be passed on in a pre-defined location to smaller vehicles that operate regionally, for example.		X				X	
Value-Added Services in Transportation								
Fleet Management	Manage the processes involving the various types of vehicles, with the intention of providing decision-makers with information on the performance of these assets.	X	X	X				X
Fleet Location	Supported by GPS-type systems, the software allows companies to track where their cargo is.	X			X			X
Scripting	Through the use of specific software, it is possible to program loads according to the type of vehicle, organize routes according to the best route and according to the variables imposed by customers and the route.							X

Definition of Modals	The study of the possible modes to be used for the transportation of cargo, according to requirements specified by customers.							X	
Freight Selection Quote	It is a system of organization of several carriers that allows the service provider to seek the best freight options, as well as to have flexibility and agility in serving their customer.	X							X
Broker Service	It consists of brokering carriers for other companies.							X	X

Source: Authors.

4.3 CUSTOMER SUPPORT SERVICES

Customer service is the component that differentiates modern logistics from the traditional approach, since currently the importance lies not only in the search for operational efficiency, but also in meeting the needs of customers (MARCHESINI and ALCÂNTARA, 2012). Logistics processes seek to provide superior quality and low-cost customer service, adding value to customers. Thus, logistics services have great potential as an instrument of differentiation of a company. Morash and Lynch (2002) found that customer service is the most important training in the search for better performance. In addition, it is related to the generation of revenues and, thus, the basis for the elaboration of a strategy in a supply chain aimed at generating a certain level of logistics service to the customer (MARCHESINI and ALCÂNTARA, 2012).

In the textile and apparel supply chain, customer service can generate more logistical integration between the various actors, reducing costs by sharing activities with service providers and improving the performance of the entire chain. For example, call-center services can be directed to logistics operators who manage the information in this channel and also relate to complaint services where they record information, monitor actions, and rework or exchange textile or clothing products.

These services serve as complements to traditional logistics processes, generating greater value for the customer and the company that offers it. The apparel industry often needs to transport small volumes of semi-finished and finished products between the various partners in the supply chain. Therefore, support services such as simulations and logistics studies are essential to improve routes and reduce transport times for these products.

In addition to the examples mentioned, there are several other possibilities for using the customer support logistics service in the textile and clothing industry. Table 4 presents a summary of the main customer support services offered by logistics companies.

Table 4

Types of logistics services to support customers offered by outsourcing companies

Type of Service Offered	Description of Service Activities	Authors					
		Power; Sharafali; Bhakoo (2007)	Aghazadeh (2003)	Daim; Udbye; Balasubramanian (2004a)	Stefansson (2006)	Hannon (2005)	Lieb (2005)
Order fulfillment and fulfillment	It consists of receiving the order from customers and covers the documents necessary for the registration of the order and its circulation among the various partners involved, including the customer himself.				X		X
Complaints	Management of complaints, involving the entire process of registration, transmission, follow-up and feedback.				X		
Call-center operation	It supports the service of the end customer, working according to strategies defined by the contractor.	X					
Customer inventory management	It involves the management of the volumes of inventory needed for sale (outbound) and for supply (inbound)	X			X		
Demand Management	It is related to the management of information that allows you to better meet market demand.				X		
Order management at suppliers	Management of orders with suppliers in order to control flows and stock levels in the supply chain.				X		X
Customs Administration (import and export)	To offer all the services inherent to the import and export process.		X	X			
Logistics collection management	To speed up the financial process and reduce wear and tear in the commercial relationship between the service provider and the customer.	X			X		
Reverse Logistics	It is the management of the return of products or inputs after the life cycle.	X	X		X		X
Development of Logistics Projects	These are specific solutions that can be offered by logistics companies to help the customer's processes.	X					X
Simulations and Logistics Studies	With the help of software, it is to generate specific solutions to streamline decision-making in logistics activities.					X	
Product Development Support	It aims to streamline the development process and generate improvements in the product design that facilitate logistics activities.					X	
Information and Logistics History	Have a database with information and histories about the logistics operations carried out by the customer, especially in relation to the market and suppliers.				X		

Source: Authors.

4.4 LOGISTICS INFORMATION TECHNOLOGY SERVICES

Information technology in support of the logistics process has been used as a great partner for the optimization of flows and improvement of the level of service (PATTERSON; GRIMM; CORSI, 2004). This innovation is essential for logistics companies to serve the market, since it contributes to the efficiency and integration of the operation in the supply chain (CHAPMAN; SOOSAY; KANDAMPULLY, 2003).

In addition, the necessary structure is summarized in equipment (hardware) and applications (Software Solutions), such as satellite transmission, web-based orders, electronic data transmission, bar codes, systems for order entry, routing, inventory systems and stock replenishment, among others (OVALLE and MARQUEZ, 2003).

The development of information technology in the logistics flow, from production operations to distribution, with systems of cooperation and information sharing between manufacturer-retailer and between manufacturer-supplier, contribute to demand management and more efficient decision-making (STEFANSSON, 2006). Considering that these processes are integrated with the management of the supply chain, it is essential for the service provider to have these technologies, thus being able to offer its contractor the opportunity to count on an increase in the processes and technology used (SAUVAGE, 2003).

For example, the textile and apparel supply chain increasingly needs its processes to be fast and efficient, especially among links closest to consumers. In retailers, when a purchase is made, this information can feed a database of a logistics company that manages the customer's inventories and can automatically articulate the various logistics processes so that the stores are replenished with products and, in addition, can generate production needs for the companies in this chain.

Another example of the importance of this type of service in the textile and apparel industry can be the management of customer complaints that can be carried out by logistics companies that can automatically record the information, evaluate this complaint and exchange or rework the product, returning the feedback to the customer.

Given the importance of information technology services, Table 5 presents some types of logistics systems that are available to companies. These technological applications support the various activities of companies that provide services to their customers, remembering that all these applications must be accompanied by the necessary physical structure (assets and space), as well as software.

Table 5

Types of logistics information technology services offered by outsourcing companies

Type of Service Offered	Description of Service Activities	Authors				
		Power; Sharafali; Bhakoo (2007)	Aghazadeh (2003)	Alkhatib; Darlington; Nguyen (2015)	Van Laarhoven; Berglund; Peters (2006)	Stefansson (2006)
WMS - Warehousing Management System	Warehouse Management System provides directed stock rotation, intelligent picking directives, automatic cross-docking consolidation to maximize the use of storage spaces.	X	X			
RFID - Radio-Frequency Identification	It is a method of automatic identification through radio signals, retrieving and storing data remotely through devices called RFID tags.	X				
TMS - Transportation Management System	Transportation Management System or Transportation and Logistics Management System, this system allows you to control the entire operation and management of transportation in an integrated way.	X	X		X	X
EDI - Electronic Data Interchange	It can be defined as the electronic movement of standard business documents between, or within, companies. EDI uses a self-collapsing structured data format that allows data to be transformed without being re-entered.	X	X			X
ECR - Efficient Consumer Response	It is a voluntary movement, based on change and continuous improvement, which affects the entire production and distribution chain of consumer products. It aims to establish a consistent flow of information and products that are included bidirectionally in the supply logistics chain					X
VMI - Vendor Managed Inventory	It is a system to optimize the performance of the supply chain, in which the supplier is responsible for managing the inventory levels at the customers.	X				X
CR - Continuous Replenishment	Continuous supply between trading partners, with information related to the actual sales given by the scanners, with supply adjusted to what is necessary, with the maintenance of minimum stocks and with information compared with the demand forecast previously agreed between the trading partners.					X
CPFR - Collaborative Planning, Forecasting, and Replenishment	It is a collaborative program between the different actors in the supply chain, which establishes coordination between production, planning, sales forecasting and replenishment.		X		X	

ERP - Enterprise Resource Planning	They are systems developed to control various departments and processes of a company.			X		
Data Warehousing	It is a digital data warehouse that serves to store detailed information about a company, creating and organizing reports through histories that help in decision-making.		X	X		
BI - Business Intelligence	It is a set of techniques and tools to assist in the transformation of raw data into meaningful and useful information in order to analyze the business.	X				X

Source: Authors.

4.5 LOGISTICS SAFETY AND SECURITY SERVICES

In response to the growing risk profile faced by companies around the world, logistics security services have been gaining attention from various industrial segments, especially those with higher value-added products HENDRICKS and SINGHAL (2003).

The increase in interest in this topic is due to the growth in the level of efficiency and integration within the chains. For Knemeyer; Zinn; According to Eroglu (2009), highly effective supply chains typically do not work with excess resources, nor do they have enough teams to collaborate on recovery after an unexpected event occurs. Additionally, due to global markets and operations, local events can have repercussions and impact in various parts of the world. Sheffi (2005) suggests that the probability that some link in the chain will suffer a rupture is high, even if the chances of each facility being affected individually are small, so in some logistical activities it is important that safety procedures are adopted.

Transportation is the main component of the logistics system, and one of the most important decisions in the management of logistics operations involves the safety of the transported cargo. For example, in the spinning industry, it is a link in the textile supply chain that has great exposure to safety risks, due to the value of cargoes. In view of this situation, whenever possible, companies end up moving cargo with monitoring, either with escort or GPS.

Table 6 presents a summary of the main logistics protection and security services offered by logistics companies.

Table 6

Types of logistics protection and security services offered by outsourcing companies

Type of Service Offered	Description of Service Activities	Authors		
		Power; Sharafali; Bhakoo (2007)	Alkhatib; Darlington; Nguyen (2015)	Daim; Udbye; Balasubramanian (2012)
Embedded Intelligence	Responsible for the real-time monitoring of carriers' and shippers' loads on a continuous basis through security and logistical support programs, which allow the visualization of vehicles, the exchange of messages and the sending of commands that enable the taking of preventive or corrective measures from the monitoring center.		X	X
Risk Analysis	These are Risk Management Plans that are prepared through the customization of each stage of the trip, taking into account cargo monitoring histories and other parameters such as insurance policy.		X	
Employee Profile Assessment	It is a quick and effective analysis of the driver's and vehicle's history, identifying if there is any divergence for the service. This evaluation significantly increases safety in the shipment and transport of cargo.		X	X
Cargo Escort	They are Armed Escort teams that monitor the cargo, further increasing transport safety, especially on roads considered high risk.	X		
Prompt Answer	It is the tactical and ostensive support service. By activating the Prompt Response team, the company receives immediate support from specialized teams in any region to locate the vehicle, at points with no signal of the tracking equipment or suspected accident.	X		
Logistics safety training	These are training sessions on the monitoring of cargo vehicles, adapting the procedures to the necessary safety conditions, guiding and minimizing operational failures. Contributing to increase safety, reduce costs, protect the lives and property of companies.			

Source: Authors.

4.6 E-LOGISTICS SERVICES

The evolution of information and communication technologies, consolidated in new equipment and software, has enabled a new model of commerce: the so-called electronic commerce or e-commerce, which is the acquisition of products without the need for physical presence at the place of purchase, allowing the transaction to be carried out electronically,

usually via the internet. Organizations seek to follow this evolution resulting from the business model created by the internet, developing skills to act and maintain themselves in this new market (NORDSTRON and RIDDESTRALE, 2001).

The logistics to serve e-commerce presents itself with a perspective of growth and challenge for new ventures, consequently the transport and distribution operation needs to be agile. In e-logistics services, practically the same tools are applied as in logistics related to traditional commerce, paying attention to the fact that they must be adapted to make virtual commerce viable, they are: the postponement of logistics; dematerialization and exchange of resources; leveraged boarding and CAM service (LEE and WHANG, 2002).

The clothing industry is one of the oldest sectors to conduct its business with the help of e-commerce, having started in the mid-1990s. Clothing products are one of the favorite and best-selling types through the internet. Therefore, the logistics infrastructure to serve this market is very important. Table 7 presents a summary of the main e-logistics services offered by service providers.

Table 7
Types of e-logistics services offered by outsourcing companies

Type of Service Offered	Description of Service Activities	Authors		
		Alkhatib; Darlington; Nguyen (2015)	Nordstron and Riddestrale (2001)	Lee and Whang (2002)
Logistical postponement	It is the condition of delaying production as much as possible, aiming to deliver on order as close as possible to the order, in order to minimize the margin of error of sales forecasts, in some cases, storage may involve activities of assembling, packaging and moving the product.	X	X	
Warehouse in Motion	The idea is not to specify quantities in advance, the products are not previously designated on the truck, this decision is postponed from the time of loading to the time of unloading, which thus becomes a warehouse in motion, to meet any changes in orders and especially on long distances.	X		

Dematerialization	It is the transformation of the flow of materials by flow of information, such as stamps, receipts, financial statements, etc.	X		
Exchange of Resources	It is the sharing of resources that can be: internet servers, information systems, communications capacity, warehouses, transport equipment or logistics experience.	X		
Leveraged shipments	It is the process of concentrating orders from customers located close to each other or the considerable appreciation of the order, that is, the better the ratio of the invoiced value transported per km traveled, the better the delivery performance.	X		X

Source: Authors.

5 FINAL CONSIDERATIONS

There is currently a growing demand for logistics services in developed markets, where customers are relatively sophisticated, resulting in a great deal of competitive pressure. Customer requirements for faster delivery, continuous shipment tracking, and electronic information transfer reflect a desire to minimize wasted time.

In view of the need to improve the performance of logistics operations inside and outside organizations, it is essential that each company focuses its activities on the main processes and has adequate services available that meet its needs. However, the vast majority of publications on the subject address a set of solutions without consensus or uniformity, probably due to the contemporaneity of logistics attributions in the supply chain.

In this aspect, the article contributed to the development of a current picture of the main types of existing logistics services, as well as their integration with the other existing logistics processes. In addition, the results of this study make a useful contribution to the textile and apparel industry and to academia, as well as to analyze the various logistical possibilities in these industrial sectors.

For future work, it is interesting to understand more specifically how the various logistics services have been used by the textile and apparel industry and how they can be optimized to improve the overall performance of the supply chain in this sector.

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