International Journal of Latest Engineering and Management Research (IJLEMR)
ISSN: 2455-4847
www.ijlemr.com || Volume 07 - Issue 01 || January 2022 || PP. 73-78

Review of an inverse logistics strategy to achieve environmental sustainability in the textile sector

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Abstract: This article describes the relationship that exists in the reverse logistics strategy as a possibility of environmental sustainability in the textile sector. It begins with a diagnosis of the current situation of consumption of textile products and final disposal of materials. Methodologically, by means of a bibliographic review, the development of a system that allows the reuse of resources and increases the productivity of the processes and the life cycle of the materials by converting them into new products that comply with the respective quality and durability guidelines is analyzed.

Keywords: Reverse logistics, Textile sector, Environmental impact, Reduction, Life cycle

I. INTRODUCTION

This document contains information about the current situation of the textile sector regarding the pollution it causes to the environment and the way in which reverse logistics acts as a solution to mitigate the high impacts that occur over time.

The increase in pollution is growing exponentially in the world over the years, the second most polluting industry of the environment followed by the oil industry is the textile sector, characterized by high consumption of water, energy, and chemical reagents. Its components vary according to the type of garment or product produced. This industry involves long and varied supply chains for production, treatment of raw materials, textile manufacturing, garment design and manufacture, shipping and export, sales, use and final disposal of the product(1). As mentioned by the global movement Fashion Revolution, this industry can generate around 92 million tons of solid waste per year worldwide and in only garment processes are produced around 1715 million tons of carbon dioxide emissions (CO2) being a very high figure. (1)

It is key to highlight the importance of this industry as it has an impact in relation to the environmental situation, a garment can take from one month to 500 years or more to decompose or degrade, which generates a high rate of contamination by textile waste, this depends on the type of fabric and chemicals that make up the garment, showing the need to find solutions to mitigate its impact on the environment. (2)

Currently speaking of the textile sector specifically for its high consumption in society, there is a large generation of waste that along with the management of these are an integral part of the economy, however there is a negative factor and is the issue of consumerism and waste as people tend to use clothes and change it every so often (3) and discard it, This generates pollution to the environment since the materials used in this sector degrade within many years, this is why inverse logistics is thought of as it covers all factors for there to be a return of a product and generation of a new useful life (4), from the consumer to the manufacturer in the process of returning the product to recycle, reuse or destroy it.

1. Textile sector

The most well-known textile products worldwide are garments. Studies carried out by Waste & Resources Action Programme indicate that a person uses a garment for about three years and the main cause of waste is because it is damaged or because it has gone out of fashion (2). This second cause comes from a phenomenon called Fast Fashion, which consists of always being in fashion, buying seasonal garments and discarding those that have gone out of fashion. This phenomenon generates a high consumption of clothing and an increase in environmental pollution.

According to the current pollution problem, studies reveal that by 2030 this will increase by 60% and around 148 million tons of textile waste per year. (2)

2. Inverse logisticsstrategy

It is important to define the strategies to be used at the time of implementing reverse logistics, then we talk mainly about defining priorities, for this you must analyze the need and the reasons for implementing the inverse logistics program; followed by this you can define the resources to be implemented since you must take

into account the time to be used and the necessary resources since you must have a budget, human resources, who directs and supervises, the benefits or cons in the process, etc. Finally, think about the customer and the communication with them when returning the product, how it will be attended, by whom, in what way and by which means.

2.1. Advantages of Inverse Logistics

Speaking of the advantages of reverse logistics implemented in the textile sector, we can see an increase in customer confidence and in their purchasing decisions, it will be possible to reuse some materials, reducing the arrival of defective products, there will be a more complete feedback on product information, the environment will be less affected, there will be a benefit-cost relationship for the company and customers, and likewise, the company's image will be improved. (5)

2.2. Disadvantages of Inverse Logistics

It is important to consider that to establish decision making policies on the subject, previous studies and in-depth research on the entire textile sector are required to make a correct decision, as well as individual and very thorough inspections of each product, and in addition to this, returns in small quantities tend to represent higher costs when integrating them back into the system.

It is also considered that on many occasions it is important to go backwards and forwards to provide the best service to the customer, this can even help to increase competitiveness in the textile sector.(6)

II. METHODOLOGY

Through a literature review, it was possible to obtain and analyze research projects, publications in scientific journals and documents contained from 2017 to the present, to obtain the information of this article, bearing in mind keywords such as: pollution, inverse logistics, textile industry, collection, life cycle. Where a total of 24 documents are obtained where different factors that induce the increase of environmental pollution, studies, projections, and key concepts are evidenced.

For information management, three phases were established, as shown in Fig. 1.

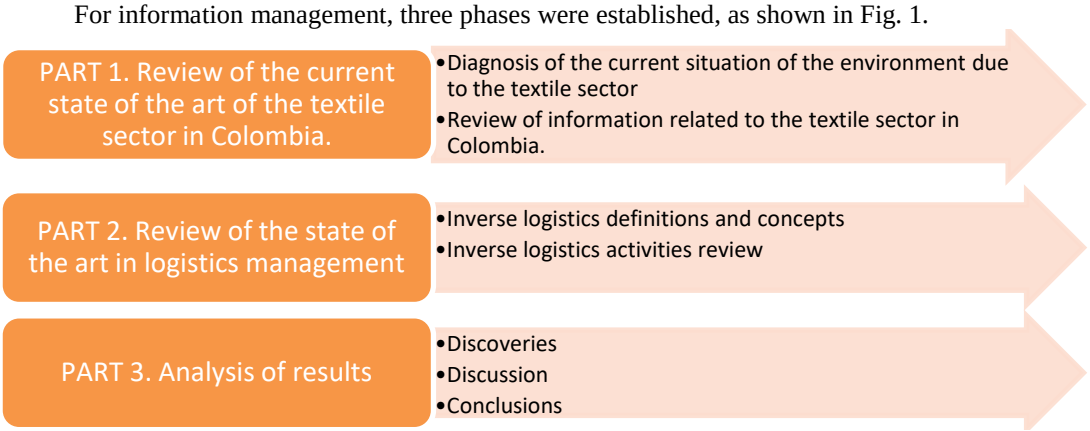

Figure. Methodological Design, (Autors, 2021)

In the first phase of the methodological design, a review of the state of the art in reverse logistics management is carried out, where information is obtained about its influence on supply chains and the development of strategies for the solution of various problems. In the second phase, a general diagnosis of the current situation of the textile sector in Colombia is made, where information from reports of entities related to the area is considered. In the third and last phase, an analysis of the results is carried out, summarizing the information gathered to contribute to a discussion on the sector's problems and thus conclude on the difficulties and impacts found in the review of the information.

1. Context of the textile sector in Colombia

Several studies have been carried out in Colombia regarding the environmental problems caused by textile product waste. One of these, determines that on average more than 1000 tons of textiles and clothing are discarded per month, the consumers of these products are even more and more, which worries the situation because these products could take up to 100 years to be disposed of. (7) which implies a significant increase in the impact of fashion on the ecosystem and the already polluted air.

It is estimated that the average Colombian consumes between 7 and 15 kilos of textiles and fashion per year. In a country of almost 50 million inhabitants, the resulting figures are high. (7) In Bogotá alone, an average of 318 tons of textile waste is generated daily, considering that 97% of this waste could be usable, but only 5% of this type of material is actually recycled. Therefore, there is a need to develop strategies to increase the reuse or recycling of raw materials to reduce the rate of environmental pollution in Colombia and prevent it from reaching or passing China, one of the countries with the highest environmental pollution in the future. (2)

Colombia must find better ways to recycle garments, through second-hand stores, donations, or pure recycling of garments.

2. Logistics and its relation in the textile sector

For the implementation of reverse logistics, it is important to consider three different aspects that will make the process can be carried out in the best and most efficient way, these are the cost-benefit considerations, legal requirements, and social responsibility, as these are the internal and external aspects of the company.(8)

Cost-benefit considerations: refers to the recovery of value in containers, packaging, packaging and handling and recyclable units, better products with a lower production cost, which in the case of the textile sector refers to the materials that are handled, whether polyester, cotton, lycra, etc.

Legal requirements: derived from waste processing cost considerations, health, and environmental protection so that materials are reprocessed and there is a second chance for the product.

Social responsibility: this aspect is driven by non-governmental organizations and customer associations seeking safer and more environmentally friendly products. It is thought that society also supports environmental sustainability and does not lose money since it has a positioning in a "Premium" segment that likes to consume in a "correct" way. (9)

III. RESULTS

Some years ago it can be said that the issue of pollution was not of great importance, however, with the passage of time we have seen how the planet is in crisis due to the wide variety of polluting components that people consume; the ecological issue is an aspect that today has begun to be important and many industries have been able to implement help to the environment through their processes and recyclable and environmentally friendly raw materials.

The textile sector is one of the sectors in which everyone in the world is included, directly or indirectly since everyone uses clothes or fabrics regardless of the material they are made of.

Most people use clothing on average 3 to 5 years in order to end its useful life or simply because it has gone out of fashion, now if we talk about the textile company is always producing clothes without stopping, changing fashion and improving garments, people want to change their clothes more constantly which makes the "old" clothes become a waste that often remains as an obsolete product; people are not interested in knowing what components the product they are wearing is made of, let alone knowing if it pollutes the environment or not, however many industries over time have been forced thanks to the few people who have been interested in taking care of the environmental issue and thanks to this, today there is a little more awareness that makes people buy friendly products with the world and also feel safer purchasing quality and environmental commitment.

The issue of the textile sector is that products are used that take many years to degrade, which as a solution is to apply the issue of inverse logistics as this allows reusing products and it is really the best way to recycle and reuse products clearly with all the aspects that must be considered to implement it.

However, there are many people in society who do not care about whether they care for the environment, which is why it is necessary that companies are responsible for providing a product that can be reused and recycled either by the same buyers, as the same company, thus providing a quality product looking at the issue of cost benefit through reuse.

IV. DISCUSS

In this textile sector it is also possible to implement the term Reverse Logistics for its products or components, since it has as fundamental elements the management of waste, recycling, reuse, recovery, remanufacturing, elimination of waste or residues integrating the supply chain and using computerization as a tool in decision making; for the implementation of this it is important to know strategies for collection or classification of the product, reduce or eliminate waste generated, and if possible, reuse or remanufacture resources, recycle or finally know a strategy to carry out a controlled destruction. (11)(12)

Inverse Logistics Classification

When implementing reverse logistics, it is essential to understand that it has networks where products or their raw material can be classified in order to see the feasibility of the product being mainly recycled, remanufactured or reused, these being the most common.(13)

Recycling networks: The products or raw materials of the textile sector can be recycled, not totally, but some components of it, in this recycling network are usually simple structures, with few links and centralized. These networks are characterized by efficient management and a high volume of recovered products. The high utilization rates of these networks are determined by high processing costs.

Networks for the remanufacturing of products: The textile sector has fabrics that can be subjected to remanufacturing, the main objective being the recovery of parts and components of products with high added value. (14) In these systems the original manufacturers usually play a very important role, being sometimes the only ones responsible for the design and management of the inverse logistics system since the subject of remanufacturing is a new invention, a new product or a new idea and can be carried out according to how it is established.

Reusable product networks: Textile sector products can be reused since their useful life time is generally very long. In this network, recovered products are reintroduced into the supply chain after cleaning, revision and maintenance; this network basically refers to decentralized structures in which original and reused products circulate, where the most significant cost is the transportation cost.

Sustainability

Customers are more demanding today about the products or services they consume, and companies seek to satisfy them with new products and innovations. (15) Thirty years ago, quality was considered an added value, being an indispensable issue at the time of purchasing a product. The same happens with sustainability, a few years ago it was also considered as an added value, but today it is almost a requirement, as mentioned by Carlos Alberto de Jesus, president of Fabricato (16) therefore, companies seek to develop initiatives of environmental responsibility and ecological environment through strategies that serve the reuse, collection, and recycling of their products.(15)

Environmental Awareness

In recent years, plastic has become more common in fashion, with 60% of all material from which clothing is made being plastic. Several studies have been conducted that point to the potential risks associated with plastic microfibers, and fashion experts along with politicians are proposing to require UK clothing to carry a label indicating the amount of plastic it contains so that customers know the percentage of contamination in each garment and thus increase environmental awareness. (17)

Technology

In Colombia, the implementation of technological advances and the development of around 150 patents in the textile industry is increasing due to the limited supply that was present around a decade ago.

New technologies make it possible to identify the impact on the sustainability of textile finishes, with respect to water, energy, and chemical consumption.(16)

Economy

In the textile sector, the Colombian fashion industry represents 9.4% of the total industrial PIB and employs around 600,000 people. In 2019, more than 1,200 companies exported products from the sector to more than 100 countries for values equal to or greater than USD 10,000. There are more than 14 thousand companies in the fashion industry, mostly micro-enterprises and Pymes, as well as a qualified, specialized and internationally recognized workforce.(18)

The World Bank officially forecasts a 3% to 4% increase in the national PIB in 2021 due to the fact that the textile sector, referring to fashion, represents 8.5% of the country's industrial PIB and for this year there is evidence of a high consumption of garments such as jeans, shoes, blouses, sportswear, beachwear and others. (19) This sector has not stopped despite the contingency caused by the Covid-19 pandemic. Textile manufacturers focused on producing face masks and biosecurity garments to balance the economy. (20)

According to projections by Raddar and Inexmoda, the fashion system in Colombia would take less than two years to return to figures like those presented in 2019. Could grow by 4% in 2021 in order to balance the decrease presented during the contingency time by Covid 19. (21)

V. CONCLUSION

It is concluded that consumerism in the Colombian fashion industry is a sector that varies according to the seasons of the year, fashion seasons among others. Clearly because it is a sector in which the entire population is included directly or indirectly, this is why it is so variable over time, since the same population created large and small industries that are mostly microenterprises and pymes, these generate a product for society, it is thought to reduce costs and provide safety and quality to the consumer, inverse logistics applied in companies helps there is a reduction in costs and an environmental issue, reducing pollution by obsolescence of textile products.

Textiles are composed of plastic and more than 100,000 chemicals. This makes the time to degrade more than 100 years which makes it really polluting, companies are aware of this because by reducing or eliminating plastic from the textile makes the product safer for the environment and in turn can be recycled in such a way that its useful life will be longer (22) and allows the product to be reprocessed and reused in a safer way so that it is beneficial for both the company and for consumers and the environment.

On average people tend to use clothing for about three and a half years and then discard it either because it went out of fashion or because it has some damage even if it is minimal, the implementation of a reprocessing in the product applying inverse logistics makes it safer, which clearly can resort in costs, however, the product is recycled and can return to be equally valuable merchandise to generate a good income again.

It is highlighted that inverse logistics or reverse logistics can be applied in the textile industry, we speak of reverse when the textile as such will be subjected to reuse, so that a strategy for collection and classification of the product will be carried out, another strategy is in order to reduce or eliminate waste (23) that in this case we speak of plastic mostly, it can be decrease it naturally or through a controlled destruction, finally the product is already classified and organized for a reprocessing of the product; On the other hand, inverse logistics can be applied since it has a cost-benefit that is supported by social responsibility, making the recycling operation public and more attractive to consumers, which makes the company environmentally friendly and makes people want to participate in it (24).

Finally, it can be concluded that it is really necessary to implement collection strategies and help the environment through inverse logistics in order to recover the majority or components of the material to create a new added value, since this helps to increase the confidence of customers when purchasing the product, improve the image of the company, recycle and reuse it to enter even in new markets that also support the environmental issue (25); However, in order to carry out and implement inverse logistics it is essential to establish decision policies based on a thorough investigation of each product and component to inspect it in the best way, and also to include the possible consequences or benefits that can be obtained, taking into account that it will be possible to go back and forth as many times as necessary in order to always improve the product and also the process and reprocessing of this including the recycling and reuse of products.

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