

Circular economy: The importance of reverse logistics

Economia circular: A importância da logística reversa Economía circular: La importancia de la logística inversa

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Abstract:

Companies currently need to innovate their internal standards to adapt to the demands that society imposes on them. Reverse Logistics ensures the return of products already used back to the industry so that they can be used in the manufacture of new products, reusing the raw material, adding value and benefits to the environment, making it possible to use fewer natural resources. This practice is opposite to the linear model used today, where products are manufactured, used and then discarded, reaching the final cycle and requiring the extraction of natural resources to manufacture new products, increasingly exploiting nature. This article aims to study the benefits of the circular economy and describe the importance of *reverse logistics* in making it possible.

Keywords: Circular Economy; Reverse logistics; Environment.

Resumo:

Atualmente as empresas precisam inovar suas normas internas para se adequar às exigências que a sociedade impõe a elas. A Logística Reversa, tem o papel de garantir o retorno dos produtos já utilizados de volta à indústria, para que eles sejam utilizados na fabricação de novos produtos fazendo o reaproveitamento da matériaprima agregando valoração e benefícios ao meio ambiente, assim é possível utilizar menos recursos naturais. Esta prática, é oposta ao modelo linear utilizado na atualidade, onde os produtos são fabricados, usados e depois descartados, chegando no ciclo final e necessitando da extração de recursos naturais na fabricação de novos produtos explorando cada vez mais a natureza. Este artigo tem por objetivo estudar os benefícios da Economia Circular e descrever a importância da Logística Reversa para que ela, se torne possível.

Palavras-chave: Economia Circular; Logística Reversa; Meio Ambiente.

Resumen:

En la actualidad, las empresas necesitan innovar sus normas internas para adaptarse a los requisitos que la sociedad les impone. La Logística Inversa tiene la función de asegurar el retorno de los productos ya usados a la industria, para que puedan ser utilizados en la fabricación de nuevos productos, reutilizando la materia prima, agregando valor y beneficios al medio ambiente, por lo que es posible utilizar menos recursos naturales. Esta práctica es opuesta al modelo lineal utilizado en la actualidad, donde los productos se fabrican, se utilizan y luego se desechan, llegando al ciclo final y requiriendo la extracción de recursos naturales en la fabricación de nuevos productos, explotando cada vez más la naturaleza. Este artículo tiene como objetivo estudiar los beneficios de la Economía Circular y describir la importancia de la Logística Inversa para hacerla posible.

Palabras clave: Economía Circular; Logística Inversa; Medio ambiente.

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1. INTRODUCTION

Population and economic growth and the acceleration of urbanization may result in more significant environmental degradation. This is because there is an increase in the consumption of goods, which leads to more excellent waste production, especially in large urban centers (Minghua et al., 2009). This has sparked worldwide reactions aimed at reducing the harm caused by this new reality of production and consumption as much as possible.

According to *Eu Reciclo* (2017), "with the dissemination of corporate sustainability, topics such as ESG have expanded the debate on reverse logistics and the circular economy in the world (our translation)". Accordingly, reverse logistics and the circular economy are important topics that can include companies in ESG (Environmental, Social and Governance) indicators and are, hence, much more sustainable.

The concern is not entirely linked to environmental aspects but also to the need for better management of productive resources, with the aim of using them more effectively to prevent them from becoming scarce in the future.

Carinho Eco Green (2020) argues that "the linear economy is a type of organization where the production chain is only concerned with extracting resources, producing goods and disposing of waste. This model is the most deeply rooted in our economy, but it is proving unviable (our translation)." As a result, it is understood that this model must cease to exist, as it promotes the deterioration of natural resources and excessively harms the environment, additionally to generating an accumulation of solid waste that is harmful to the environment.

To minimize the environmental impacts caused by the linear economic system, the Circular Economy works to close the product's life cycle, aiming to use it efficiently in the production process to minimize waste and the generation of residues (Morseletto, 2020; Ellen Macarthur, 2021). To achieve these goals, it is essential to increase the remanufacturing, refurbishment and recycling of products so that unused components and materials continue circulating instead of being discarded, often incorrectly.

The Circular Economy comprises multidisciplinary concepts (ecological, environmental and industrial economics) and is a counterpoint to the linear economy. From this perspective, the intention of circularity is observed in the continuous use of productive resources based on repair, reuse, reconditioning and recycling strategies during the manufacturing process and product use (Ghisellini et al., 2016). In this way, natural resources are used more consciously and less exploited, resulting in a greater balance between the economy and the environment.

Reverse logistics is part of the closed cycle proposed in the circular economy. It is responsible for the return of post-consumer and post-sale goods to the business and production cycle through the reuse of materials (Araújo; Macêdo, 2021). In other words, Reverse Logistics is very important in the Circular Economy cycle, as one complements the other and thus enables better waste management. In this



way, there are fewer environmental problems through the reduction in the consumption of natural resources, reduction of landfills and less emission of polluting gases. All of these indicators add value to companies and customer satisfaction.

This article aims to conceptualize definitions and theories and show the relationship between the Circular Economy and the Reverse Logistics process. For this purpose, there was an analytical and bibliographic review of articles and books on the internet that discussed the aforementioned theme and notably made it possible to understand that the two concepts complement each other by adding value to the life cycles of products in general and benefiting the environment as a whole.

2. THEORETICAL BASIS

2.1 Concept of Circular Economy

According to the European Parliament (2023), "the circular economy is a model of production and consumption that involves sharing, reusing, repairing, renewing and recycling existing materials and products, as far as possible (our translation)." This will result in a longer life cycle of products, a reduction in waste, and inappropriate waste disposal, thus reducing environmental pollution.



Figure 1. Phases of the Circular Economy Model

Source: Current affairs of the European Parliament (2023)

Figure 1 shows the life cycle of products when they are part of the Circular Economy model. Initially, a new product is generated from raw materials, and to begin the production process, it goes through an analysis stage that determines whether the product is sustainable. After production, the product is distributed for consumption. In linear models, this product would usually be discarded after use. On the other hand, this product is collected in the Circular Economy model,



emphasizing the Waste Management stage to determine what will be transformed into residual or recyclable waste, allowing a new manufacturing process. In this way, fewer raw materials and waste are used, and fewer pollutant emissions are caused. Generally, products are produced, used and then discarded. However, within the Circular Economy, they can be recycled. When they go through Reverse Logistics, they can be used in a new production cycle, keeping the Circular Economy alive, allowing continued use and adding value to new products.

Quality Group (2022) defines the circular economy as "the science that rethinks long-term economic practices, going beyond those famous three "R" s – reduce, reuse and recycle – because it unites, at least in theory, the sustainable model with the technological and commercial pace of the modern world, which cannot be ignored (our translation)". To develop a structural model of reuse, the concepts of product regeneration must be put into practice. In this way, instead of products being discarded incorrectly and having a short useful life, they become part of continuous production cycles. When there is no possibility of reuse, they will be disposed of correctly, fully responsibly and appropriately.

The Circular Economy presents the improvement of values of resources extracted and produced in flow through integrated production chains. The future of products ceases to be a question of managing leftovers. It becomes part of the product and system design methodology to expand the capacity for using resources with an exceptional focus on urban and industrial waste to find consistency and conformity between the economy, environment and society. (Webster, 2015).

Ecoassist (2022) conceptualizes that:

The Circular Economy is related to economic development using natural resources sustainably. This includes business models and manufacturing processes that allow for less dependence on new raw materials that have not yet been used and reused. In practice, the circular economy consists of the larger-scale use of renewable, recyclable resources with excellent durability. Furthermore, waste becomes cyclical and better used, returning to industry and gaining a new use. In this way, preserving the natural ecosystem and optimizing the materials already being used is possible. Ecoassit Group (2022, our translation).

Accordingly, the circular economy aims to add value not only to the companies that practice it but also to generate benefits for society and the environment. Implementing related activities can also reduce our exploitation of natural resources and, on top of that, give value to products in a totally sustainable way.

2. 1.1 Main Activities of the Circular Economy

According to *Eu Reciclo* (2017), "the main idea of the circular economy is the creation of objects and materials that can always be reused and recycled and remain in the product life cycle instead of becoming waste (our translation)". In this way, waste that could be disposed of incorrectly can be transformed into a continuous production process in which it is no longer just discarded and begins to have repetitive cycles of reuse.



Quality Group states that the production system of the products currently used has a beginning, middle and end; consequently:

Our production system operates linearly, which is not sustainable due to the excessive exploitation of natural resources and the considerable accumulation of waste. We exploit raw materials, produce goods and then discard them. Planned obsolescence, a technique that produces items with their helpful life already established, generates waste that is not used again and accumulates exponentially. Compared to Latin American countries, Brazil is the champion in waste generation, producing around 541 thousand tons per day, according to data from the United Nations. Quality Group (2022, our translation).



Figure 2. Non-sustainable linear production system of products.

Source: Quality Environmental Group (2022)

In Figure 2, it is possible to identify that the process of using products currently adopted has a beginning, middle and end. In this way, all products used are disposed of inappropriately, generating environmental pollution and depletion of raw materials. Moreover, there is always a need to use natural resources since they are never reused in manufacturing new products, which makes this cycle much more worrying.

Figure 3 shows step-by-step how the linear economy works. It begins with the extraction of natural resources to acquire raw materials for manufacturing a product, then distribution, and after consumption, disposal. This model must be changed because it is completely unsustainable, and the consequence of unconscious disposal is directly linked to environmental problems due to the spread of solid waste.

It is possible to considerably change the current paradigm, enabling an infinite cycle in the use of natural resources and promoting the Circular Economy in a way that adds considerably more quality of life to the population, reduces environmental pollution and reduces the exploitation of natural resources. Grupo Quality Ambiental (2022).



Figure 3. Linear Economy Model

ECONOMIA LINEAR



Source: Carinho Eco Green - Circular x Linear Economy: a genuinely sustainable way of producing

2.1.2 Benefits of the Circular Economy

Regarding the Benefits of the Circular Economy, the Industry Portal states that:

New sources of investment, optimized use of raw materials, less waste, increased job creation, greater operational efficiency, economic growth, population awareness, more cautious and environmentally conscious consumption, and opportunities for new businesses and job creation are other advantages of the circular model. It is a smart way for companies to make new uses to existing resources. Besides becoming more sustainable, the circular economy makes processes more profitable. It seeks to restore physical resources and regenerate the functions of natural systems, bringing more significant economic and social opportunities (our translation).

Therefore, it is possible to understand that the circular economy aims to manage natural resources more effectively. In this way, natural elements can increase their utility value amid economic activities of sustainable growth.

The pioneer on the subject, Ellen MacArthur Foundation (BANKS and PARKIN, 2017), divides these benefits into five blocks: economic; environmental; social; strategic; and operational, adding that the benefits arising from each of them are not limited to the industry, but also to the consumer and society. In the industry, there is the opportunity for new business models, highlighting the reduction in the cost of raw materials and energy and the income from resources that would otherwise be discarded (if a linear model were used). For society, jobs are generated, reduced costs with landfills and potential economic stability (our translation).

In other words, the benefits are general, both for people, the environment and the companies that adopt such measures, as they can gain credibility with customers and save on the acquisition of new raw materials.

The circular economy is an economic system that is based on business models that replace the concept of 'end of life' with the reduction, reuse and recycling of materials in production, distribution and consumption processes, operating at the micro level (products, companies, consumers) [...] and macro (city, region, nation and beyond), with the aim of achieving sustainable development, which implies the creation of environmental quality, economic prosperity and social equity, benefiting current and future generations (KIRCHHERR et al., 2017, our translation).

Consequently, the Circular Economy is important for everyone: people,



companies and the environment. Thinking long-term is also important for future generations, as it will positively impact on the environment and bring countless benefits to society.

In the Circular Economy model, the product production cycle is continuous, preserving natural resources. The objective of this method is to reuse raw materials to manufacture new products in a way that considerably reduces the waste that will be discarded, enhancing benefits to the environment and economic growth (Martins, 2013; Foster et al., 2016; Moraga et al., 2019).

2.2 Reverse Logistics

Ecoassist (2022) argues that to manage the waste after its use; Reverse Logistics is the primary method to organize it most appropriately, whether for final disposal or return to the manufacturer for reuse in a new production process. Additionally, it mentions that there are three types of Reverse Logistics, namely:

- Post-consumer Reverse Logistics: This is the most common, as it begins through selective collection, where the end consumer puts the service into practice to return used products to the industry and continue the reuse process;
- Post-sale Reverse Logistics: very popular when it comes to online shopping, when the customer receives a product that did not meet their expectations and decides to return it, either because they received a defective or wrong product or for whatever reason; and
- Reverse Logistics reuse: option by which products are collected, packaged and returned to the production process as raw material instead of simply being discarded. The production industry exclusively assigns this method and may involve institutions specialized in the Reverse Logistics process.

One of the pillars of the PNRS (*Política Nacional de Resíduos Sólidos* - National Solid Waste Policy) is reverse logistics, an instrument of economic and social development characterized by actions, procedures, and means designed to enable solid waste collection and return to the business sector. Companies must reuse waste in their production cycle or other chains or give it an environmentally appropriate destination (Instituto Ethos 2012). It is understood that Reverse Logistics guides the collection of products that have already been used and returns them to the manufacturing process and reuses in the Circular Economy model, ensuring responsibility on both society and industry, thus extending the useful life of products and avoiding the extraction of new raw materials from the environment.

Reverse Logistics can be defined as the field of logistics that controls the flow and information regarding the return of materials already used in the production cycle through reverse distribution channels, thus adding economic, ecological and image value to customers (Leite, 2017). Thus, it can be concluded that Reverse Logistics makes used products return from the consumer to the manufacturer, which guarantees positive values for companies.



2.2.1 Reverse logistics as a tool in the circular economy

According to *Eu Reciclo* (2017), the circular economy works alongside reverse logistics, as the concepts of circular economy include:

- a) Reuse: where the end consumer will be responsible for reusing the product;
- Remanufacturing: is when a product is reused after the disassembly process, where its parts undergo a cleaning, repair or replacement process (in cases of breakage) and undergo a quality test to guarantee its functionality;
- c) Updating: when it comes to electronic products, where an update is made so that necessary updates and corrections occur to ensure better functionality of the products so that there is no need for exchange;
- d) Reassembly of the product: The product that undergoes this process must guarantee perfect conditions for use;
- e) Recycling: This process involves transforming an unused and disposable product into a new material or product with more outstanding added value, which is entirely usable and of quality.

Figure 4 (four) shows the reverse logistics flow. It shows how the entire business model structure should be from start to finish. In this model, instead of being the last, the consumer becomes part of the first position in the supply chain, being responsible for the correct division of recyclable materials and sending them to the first position in the cycle. From there, the second stage of reverse logistics begins, creating a connection between the end consumer and the industry. Finally, the third stage ensures the final objective, which is to recycle, transform, remanufacture and reuse the products. Based on this reverse logistics process, it is possible for all products to be used as raw material for new cycles, generating continuity in the continuous reuse process.



Source: NEITEC (Center for Industrial and Technological Studies) (2018)



According to NEITEC (Center for Industrial and Technological Studies, 2018, our translation):

In the context of the Circular Economy, Reverse Logistics is presented as a new business logistics model that aims to plan, operate and control the flow of aftersales goods, ensuring their return to the production cycle. This model goes against the traditional linear logic, where products made from natural resources are processed and discarded after use, which is environmentally harmful and has low economic efficiency. Reverse Logistics (RL) involves all players in the chain, from industry to the consumer, as outlined below:

The relationship between the Circular Economy and Reverse Logistics can be confusing because they have similar concepts. Nevertheless, Reverse Logistics operates within the Circular Economy, encompassing all stages and becoming much more comprehensive. While Reverse Logistics is focused on business, the Circular Economy encompasses economic, social and environmental factors (Genovese et al., 2017; Pereira et al., 2020, our translation).

Reverse Logistics plays a fundamental role in conjunction with the Circular Economy, as it is directly linked to the product recycling process. In this way, pollutants can be reduced, and the reuse of raw materials tends to increase. It is also worth highlighting that the circular economy's main objective is to significantly extend the useful life of products, and based on this perspective, reverse logistics is the main ally in coordinating the reusing and/or appropriately disposing of waste. Ecoassit Group (2022, our translation).

2.3 ESG

For PUCRS online (2022), the term *Environmental, Social and Governance* (ESG) is an acronym in English that translates to "Environmental, Social and Governance". It is a way of defining and establishing whether a given company's practices can be considered socially responsible and sustainable. For that reason, this concept can be used to show how companies have reduced their impacts on the environment and how much they care about society when making decisions in administrative processes.

According to PUCRS online (2022), "the acronym brings together the three factors responsible for showing how committed the company is to sustainable investment (our translation)". Learn about the 3 pillars of ESG:

- a) Environmental: It is related to the company's standards for preserving the environment and the ways in which they act regarding issues related to global warming and carbon emissions, air pollution, water pollution, concern for living beings that live in nature, deforestation, energy efficiency, waste management and water scarcity.
- b) Social: This refers to companies' social responsibility towards the community and shows whether the institution complies with the standards set out in human rights, labor laws, and others. In addition, it seeks to consider whether the organization preserves the diversity of its personnel, values workplace safety, is responsible for data protection and privacy, and is committed to society, among other things.
- c) Governance: This concerns the company's management policies related to conduct within its corporate environment, the formation of the board, the anti-corruption practices adopted, and a communication channel for complaints and



audits, among other things.

The population is increasingly concerned about problems related to the environment, which is why they are increasingly demanding initiatives from companies regarding issues of social, environmental and governmental responsibility. Based on this principle, it is possible to state that, for companies to remain ahead of the competition in the market, they need to be more visionary about these issues, considering their financial, social and environmental impacts.

3. METHOD

This article was based on bibliographic research, based on books and scientific articles via the internet.

In general, search engines used keywords related to the present topic. The keywords used included the terms "circular economy," "circular economy and reverse logistics," and "reverse logistics," with the aim of identifying the concepts, definitions and connections between the circular economy and reverse logistics.

Bibliographic research is an indispensable research method for guiding scientific research. This research method seeks to explain and debate issues, themes or problems "[...] it is a form of theoretical scientific elaboration or part of any scientific research, with a view to the theoretical elaboration of the study." (Martins; Theóphilo, 2016, p. 52, our translation).

This study aims to present the importance of reverse logistics as a tool for the circular economy and how it can contribute to companies becoming increasingly guided by ESG (Environmental, Social and Governance) indicators and consequently more sustainable.

4. RESULTS AND DISCUSSION

This study addressed the concepts of Circular Economy and Reverse Logistics. The research showed that the linear economic model is currently used, where products are manufactured, used, and discarded. This model is harmful, as it is an aggression to the environment due to the large amount of waste discarded.

Based on this premise, the Circular Economy began to be considered an economic model in which products' raw materials are reused or disposed of responsibly. In this context, reverse logistics has become an important tool to make it viable. They are thoroughly linked to each other and complement each other. This is possible because, while the Circular Economy seeks to use all discarded products as raw materials in a new manufacturing process, Reverse Logistics works as a tool to return these products to the production chain. In this way, the linear model that limits the useful life of products no longer exists, contributing to the formal expansion of the Circular Economy.

It is important to use technologies applicable to reverse logistics to manage the entire organizational process. Society plays an extremely important role in



ensuring that product returns are fully effective, and the industry must play its role responsibly to ensure that products are truthfully used. Finally, the selective collection sector must collect products so that they can be sent back to the industry.

5. CONCLUSION

Finally, it is possible to conclude that the Circular Economy, with the essential participation of Reverse Logistics, becomes a viable solution to correct the numerous existing environmental problems. It is a totally effective method and of great importance for minimizing pollution caused by solid waste and the problems it can cause for society, for living beings and, mainly, for achieving truly sustainable development.

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