Economic Model Of Costing And Management In Crossdocking Systems

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Abstract

This document talks about the management of business resources, specifying the circular economy and Cross Docking models, for which an analysis of its different characteristics was carried out through an investigation of several documents and scientific articles published, related to the subject. With this in mind, an overview is provided explaining the different concepts and their rationale, the key features, and the most important tools. The analysis of the different strategies proposed in the implementation of the different models highlights the incredible leadership in different countries where these processes are getting better and better. Interested readers will be able to deepen their understanding of the subject from the references provided. It should be noted that in all organizations and companies there are many processes that need to be managed for their correct development, such as finances, customer service, different inventories, as well as sales and human resources. The existing challenge in this area is to effectively control and manage all the company’s resources. Therefore, the maximum demand must be satisfied with the minimum effort, and for this the effort of all the components of the organization must be properly managed. Within this order of ideas, it is there that we note the importance of the circular economy and Cross Docking models, which have become paradigms in the search for sustainable development, proposing different strategies throughout the chain, production and use of products and services. With this in mind, we mention different models and strategies to properly manage business resources.

Keywords: Circular economy, Cross Docking, business management, resources, sustainability, stability

Introduction

Today, companies apply a traditional "extract, produce, consume and dispose" model, resulting in scarcity of virgin resources. This model is known as linear. Today, a paradigm shift is needed in companies to make the transition from a linear to a circular model possible, helping to make better use of waste management.

By using this model and accompanying it with a Cross Docking strategy (Quick Delivery and Quick Dispatch), a more profitable resource management can be achieved. Cross Docking allows the logistics process to avoid the need for warehousing of products in production. The circular economy is understood...
as a production and consumption model that involves comparing, discarding, reusing, repairing, renewing and recycling existing materials and products. As many times as possible to create added value. (CTA, 2021).

On the other hand, Cross Docking can be understood as the distribution system in which goods are received from suppliers in a warehouse, or distribution center and are not stored, but are immediately prepared for their next shipment, in this scheme there is no storage pass (Andres Quintana, 2017). The advantage of this system is that it significantly eliminates warehouse inventory. With little merchandise standing idle, it would save a lot of space and also decrease costs in referrals. In addition to being a fast model, it achieves greater freshness of the merchandise and an increase in its availability.

So considering the above, it can be mentioned that cross-docking is a logistics technique used to speed up the process of delivering products and materials to customers. This allows companies to reduce preparation and shipping times, which translates into a significant improvement in overall logistics efficiency, making it possible for companies to reduce the cost of materials and waste, as well as improve the sustainability and efficiency of their operations. The combination of these two techniques helps improve the efficiency of product delivery processes, while reducing production costs and waste. In addition, the use of the circular economy in the management of corporate resources helps reduce the company's environmental impact while improving the sustainability of operations.

According to (Elena Pérez Lagüela, 2019) when we remember the circular economy we can not only talk about the environmental benefits associated with proper waste management, but also the economic benefits that come with saving raw materials and reuse of waste.

Something to keep in mind when planning to implement these models is that if you do not have a good structure, it may require a large investment of money, causing changes in the production line and structures with new functions for waste. An environmentally responsible resource management and storage reduction process is the solution.

Why is the traditional warehousing model not so strongly supported today, and why do we seek to reduce warehousing as much as possible? Experts have identified the problems and disadvantages of continuing with the warehousing model. Starting with the fact that it requires a large investment in warehouse facilities such as shelves and adaptations for the required warehouse spaces, as they say: the stored product is a waste of money.

This is due to the particular fact that the stored product will progressively lose value on the market. Other present disadvantages of the storage is that the products suffer unforeseen risks with uncertain situations: theft, fire, breakage or natural disasters.

Faced with the need to create competitiveness in the supply chain, (Bujis et al., 2014) they mention that every day new ways of distributing products are created to ensure customer satisfaction. One of the means created is the Cross Docking method, it is a distribution strategy that allows the consolidation of less than full truckload shipments into full truckloads without long-term storage. Due to the absence of a storage buffer within cross-docking, local and network-wide cross-docking operations must be carefully synchronized.

One of these strategies consists of managing the distribution of goods through cross-docking. The fact that goods are not stored, but placed at the point of sale, for the sale of the goods themselves, is extremely important and beneficial for companies, because it is at the point of sale where the goods create value, and not in some warehouse. For companies to implement this strategy, it is necessary to know the entire logistics chain, starting with demand forecasting, supplier relationships, supply chain, inventory management, distribution channels and ending with the distribution of the goods themselves (Ricardo, 2012)
The just-in-time philosophy describes how the optimization of the production system should be performed. It is about supplying the production line with raw materials and parts as needed, it goes hand in hand with Cross Docking, so it also becomes important to mention. (Vidal Rodriguez, 2019).

**Theoretical basis for the course**

One of the tools that can be used to improve operational efficiency in an organization is the use of management systems. This is fundamental for the operation of a company and the achievement of its strategic business objectives, which requires the implementation of improvement policies that have an impact on better access to information through good management processes that help to organize better structures. The application of this model by organizations should be one of the actions implemented in their production systems as part of their social responsibility, since it is imperative the commitment of companies with society and with the care of the environment to improve the quality of life. (Gonzales & Vargas, 2017).

The current dominant economic model is based on the optimal use of resources and factors of production, the use of fossil fuels and the accelerated exploitation of natural resources. These are open to the emergence of an alternative economic model known as green circular economy. Environmental degradation is a global problem and it is necessary to establish a regulatory framework at the national, regional and international levels. (Margarita & Martinez, 2018).

**Circular economy and resource management models**

A circular economy ensures long-term sustainable growth in a given production model, because it promotes the optimal use of resources, decreasing the use of materials that are not necessary, by recycling or reusing waste in new products. According to (Cerdà & Khalilova, 2016) a circular economy is restorative and regenerative by design, and aims to always keep products, components and materials at their highest levels of use. The concept distinguishes between biological cycles and technical cycles. That is, it is a positive continuous cycle of development that preserves and enhances natural capital, optimizes resource efficiency and minimizes systemic risks while managing limited supplies and renewable energy flows.

Therefore, the circular economy aims to extend the useful life of products and improve existing resources. A balance must be created between growth and sustainability, just as it happens in nature where everything has value, everything is used and waste becomes a new resource. Following this clear example, the concept of economic development emerged.

(Lett, 2014) expounds that successful projects are research-based and involve experienced professionals from a variety of fields, including engineers, technologists, microbiologists, architects, ecologists, sociologists, and educators, among others. In addition, the state must play an important role in implementing and revising regulations and laws aimed at motivating citizens to participate in this process, as well as providing incentives for businesses to participate in environmental policy. Ultimately, only responsible societies committed to protecting the environment can avoid the chaos that is growing closer every day, and open the way to a future in which we still have a place to live on this planet. The principles of this method are based on restructuring systems to maximize the use of resources and minimize waste. This includes creating products and services that are more energy and resource efficient. As well as minimizing waste of resources. This is achieved through optimizing production processes, using recycled materials, reviewing production approaches and optimizing packaging. The circular economy also focuses on repairing and reusing products to extend their useful life. This helps to reduce the amount (MacArthur, 2019).

**Cross docking**

Cross docking is one of the best solutions for handling products in the supply chain because it reduces
transportation costs by consolidating products in a single truck and avoids storage of products, since products
are sent directly from delivery to dispatch which generates savings in inventory levels. In addition, the time
spent in logistics platforms is reduced, as transit times can be up to 24 hours. Once received, it must be
distributed the same day or next day at the latest. Products are sold faster on the shelf to end customers,

As mentioned above, several cross-docking methods are based on grouping suppliers in a logistics platform
to complete a single shipment, sorting and consolidating products by destination or customer. In addition,
since the customer does not have the product in stock, each shipment receives products from a different
supplier. All these aspects make cross-docking very useful in different areas of production and distribution.

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In the 1990s, it took companies 15 to 30 days to process orders and deliver them to customers. The
normal process included gathering information, routing orders, processing orders, authorizing credit,
assigning orders to warehouses and finally shipping them to customers. In recent years, there has been a
demand for a wide variety of products and services to meet the tastes and needs of customers, and
providing better services requires the competence of transportation companies and the agility of
operations. This global connection allows the company to have diverse customers around the world and
to better understand their needs in order to create products with precise specifications, deliver products
faster, reduce breakdowns, better understand demand, improve product quality, and improve customer
service. (Serna & Navia, 2010).

**Types of cross-docking**

Three types of cross-docking can be found, among them are direct, indirect and mixed. All this depends on
the contract negotiated with the supplier, since it all depends on the location or person responsible for
preparing or sorting the goods. According to (EAN International, 2000) in direct cross-docking, the units
received are previously selected by the supplier, according to the site orders are received and transported to
the departure dock for consolidation with similar packages from other suppliers in delivery vehicles to the
premises without further handling.
On the other hand, in indirect cross docking according to (Corzo Rivera & Rodriguez Burgos, 2012) the units are first received and then fragmented and labeled for subsequent delivery, if this modality is compared with the previous one, in this one more operations are required. However, there is also mixed cross docking, which occurs in those cases in which some products that have just arrived are added to products that were already stored previously. In other words, new goods are combined with other stored products. (Ferreras, 2019).

One of the benefits of this model is noticeable in the response times, which are faster and have better customer service. The quality of service is maintained by speeding up the shipment of goods and ensuring that delivery arrives on time, especially in direct cross-docking. Another benefit is that goods are rearranged in warehouses before loading, which optimizes truck routes and stops, reducing logistics costs associated with storage and inventory holding, as well as reducing shipping services, and reducing the risk of product spoilage, since it will remain in stock for a short period of time.

As a consequence, the administrative work of warehouse personnel is limited, thus reducing the risk of loss. Another important advantage of this model is that it increases the sustainability of the supply chain, due to good sorting through better design of transport routes so that resources are not wasted during transport. In addition, no additional storage space is set aside to store these items. As a result, the carbon footprint of logistics is significantly reduced.

From the point of view of (Palma, 2012) Cross Docking warehouses are not like traditional Distribution Centers. Their appearance resembles a large parking lot. Their concern is not storage, but the coordination of incoming and outgoing flows. There are international standards and regulations for their design, to calculate maneuvering yards, loading docks, building configuration in U, H, T, etc.; there is not much written about all this.

**Resource management methods in companies**

Clearly, most companies are looking for ways to reduce their costs, manage profits, increase efficiency and productivity, in order to meet customer demands. Cross-docking is a creative design that continues to position itself in the world. While it is not a new process, it has received attention in recent years as it offers exciting opportunities to reduce lead times, control material costs and produce goods on time. (Jaramillo & Marín, 2016).

In recent years, more and more companies have implemented this method, in connection with the advantages of logistics. Although some organizations have not yet initiated this process, they see opportunities to improve the distribution of goods offered and may consider future implementation. This is an impressive approach for many companies facing financial and competitive challenges.

The elements or factors involved in the service. The first actions should be aimed at selecting the customer service factors that are most important for the case under study, such as response time to requests for quotations, product availability, flexibility in the face of variations, relationship between the price offered and the competitor's price, solutions to complaints, and others.

According to (Castellanos Ramírez, 2015) the different elements or factors related to service should select the most important customer service factors for the case in question, such as response time to a query, product availability, flexibility in the face of deviations, price offered and competitor's price, dispute resolution, etc.

Different companies can be found that show considerable success in using cross docking models, among them are Homecenter, Makro, Warehouses Success, Walmart, among others.
Supply Chain Management

Supply chain management is the process of managing products and services from their point of origin to their final destination. This includes planning, coordinating and controlling all activities necessary to meet customer needs. These activities include transportation of goods, delivery of goods, inventory management, order tracking and quality assessment. Supply chain management is an important tool for maximizing a company's efficiency and profitability.

As it shows us (Borray et al., 2017) supply chain management is responsible for the management, planning, coordination and execution of all activities that integrate the functions of suppliers, manufacturers, companies and customers, thus managing supply and demand within organizations.

One of the main functions of logistics in the supply chain is the optimization of production processes from the procurement of inputs to the delivery of goods or services to the final consumer and the return of the same. (Arévalo & Vera, 2018). mention that there are a variety of systems used to model processes in general, the instructional model sees the methods as composed of instructions, generally expressed by imperative regulations, in this case what is desired is to create a Cross Docking system that does not devolve from a manual, so this system was not considered in the project.

Multiple systems are often used to model a process. A model defines instructions as a set of instructions. These instructions are usually expressed as by imperative regulations. (Muller, 2007) It points out that inventory comes with a number of costs, such as labor, money, the space in which it is kept and moved, all of which influence spoilage and obsolescence, as well as theft. In organizations it is necessary to take into account the costs associated with inventory management. Starting with the cost of ordering, the larger the lot, the larger the inventory and fewer orders will be placed per year, which is reflected in lower ordering costs, since it will not have to make more purchases, or tracking of orders and entry of goods in the warehouse. A second one is also mentioned, which is the cost related to lost sales and dissatisfied customers due to stock shortages. Finally, the acquisition cost, every time large lots are purchased, the amount of inventory increases; however, due to volume discounts and lower freight cost, the unit cost can be lower.

Method

For the correct elaboration of this article we worked on a uniquely theoretical methodology through the investigation of available documentation, subtracted from information repositories of different universities, scientific articles, among others, analyzing them critically, and focusing on essential points of the circular economy and Cross Docking in the improvement of business resources. Drawing the base information from academic articles following a series of steps established as follows:

We began with general research in search engines, such as databases of academic journals and electronic books, using keywords such as "cross docking" and "circular economy". With this search we were able to identify basic definitions, key concepts and bibliographic references on the topics. The second step followed the deepening of these specific topics, i.e. a focus on the application of cross docking and circular economy issues to enterprise resource management. This required research on specific related topics such as "warehousing and distribution", "resource management" and "resource management in the circular economy". Thus providing references to reports, studies and research papers.

Highlighting the improvement of the productivity of a warehouse by means of the Cross docking technique by (Gonzales H., 2017) and Circular economy, the new placebo of an environmental utopia? by (Castroviejo, 2001) Third, subject matter experts were consulted to gather information on how cross docking and circular economy issues are applied to business management. In other words, professionals
related to the subject matter were sought through online chats with industry leaders and participation in professional forums and networks, among which the Academic Program of the subject production planning should be mentioned (López, 2022).

Fourth, case studies were investigated to obtain information on the practical application of cross docking and circular economy issues in business management. From information available in electronic files, reports and books. Of particular note are (Muñoz, 2017) on the Integration of a reverse logistics policy in a cross docking station as a business sustainability strategy of a smart supply chain.

Finally, trends related to the application of cross docking and circular economy issues to business management were investigated, including recent news, market reports and trend studies.

**Results**

To implement this model in a business management system, each warehouse must be assigned an access ramp. This crossing is initiated when a delivery is scheduled with a supplier and the goods arrive there. The truck parks there and decides whether to go directly or indirectly to the starting point. At this point, the products are unloaded, sorted and selected for ease of handling and then, when the products are ready and sorted, they are taken to the point of origin to begin transportation and delivery to the end customer.

It should be noted that good communication with the warehouse, point of sale and service providers is essential. Even the process requires an adequate flow of goods related to the business must be taken into account. In addition, having a warehouse management system is very practical and important for logistics. (Escobar, 2020).

When it comes to implementing this system in companies, good planning is of utmost importance, as well as good technology and according to (Cifuentes, 2021) although it is difficult to implement, once achieved, it becomes an optimal and efficient distribution system. Allowing the company to achieve a more optimized supply chain, which minimizes rework and generates capital for the company. The advantage of the model is that it can be delivered within 24 hours. The advantage of the model is that it can be delivered within 24 hours, thus providing great savings for the business, as well as the satisfaction expected by customers, suppliers and end users. In addition, it increases the productivity of logistics and transportation processes.

In the Error! Reference source not found. can be appreciated the different thoughts of the circular economy that have emerged in recent years, and that have their basis for this model in different companies. Although a completely circular economy may not be present, this does not mean that progress cannot be made in areas where reuse and recycling are possible. These are the different opinions of the schools of thought which are essentially turned to the current production system. It is necessary to produce products that can be recycled, and instead of conserving fossil fuels that are highly polluted, to use renewable energy. (Martinez & Porcelli, 2018).

Considering Figure 2, the first step to follow to design the cross-docking operation, is to gather some initial data, that is to gather specifications such as physical characteristics, its packaging, among others to organize the way it should be handled, distributed and manipulated in the warehouse. Among these specifications are (Salcedo Acosta, 2019).
Following this, in the second step, an experimental design is carried out, which is defined as one or more tests designed to characterize the most influential explanatory variables or factors in the test of interest. (Melo et al., 2020) as one or more tests designed to characterize the most influential explanatory variables or factors in the test of interest, evaluated by one or more response variables, so that when controlled, the explanatory variables of some process are intentionally or systematically modified, always observable or the changes it makes to a quantified response variable.

The third step is to run the tests taking into account each of the previous steps, calculating the sample size, followed by the fourth step, the results obtained are evaluated, and finally the cross docking operation is designed with the results obtained from the project. (Salcedo Acosta, 2019) Citing (Kreng & Chen, 2008) Two models of production and distribution coordination have been developed to reduce the costs associated with the supply chain. The distribution center function distinguishes between inventory reconciliation locations and inventory storage locations. The former is a cross-docking strategy and the latter is a traditional warehousing strategy. The analysis of the study is used to illustrate the developed model. From there, it can be said that cross-docking strategies in large systems lead to cost savings throughout the supply chain.

To understand the efficiencies between the models, two separate analyses were conducted to create an overall cost comparison between these methods, then a regression analysis was used to estimate order volume and overall cost savings. In terms of warehousing costs for the first approach, both manufacturers and distribution centers require more warehousing space. Although, because the second approach uses a direct transit shipping policy, goods remain in stock for a very short time, which reduces the space required for warehousing, greatly reducing the overall system cost compared to the first approach. It was found that by producing multi-product cross-docking policy coordination and production planning can be extremely variant (Kreng & Chen, 2008).

Taking into account research from different sources the application of Cross Docking and Circular Economy in the management of business resources can serve to optimize production processes, improve resource efficiency and minimize waste. This can be achieved through the use of measures such as the reuse of materials, recycling, material exchange and the implementation of cross docking practices to reduce storage costs. In addition to the above, a number of results are identified as follows:

1. Cross docking allows companies to reduce storage and transportation costs, increasing the efficiency of the supply chain and achieving better inventory control. This is because products are transferred directly from suppliers to the customer without passing through the warehouse, thus avoiding storage and handling of products.

2. These methods help companies reduce their carbon footprint by minimizing the amount of fuel needed to transport products and by reducing the amount of product wasted due to minimized storage. This
contributes to the circular economy, as products are used and recycled more efficiently.

3. Increases the speed of product delivery, reducing delivery time. Allowing companies to offer faster deliveries and, therefore, better satisfy their customers.

4. Cross docking allows companies to more easily adjust their operations according to changes in customer demand. This improves supply chain agility, enabling companies to adapt quickly to market changes.

Discussion

Cross docking and circular economy are concepts related to logistics and sustainability. Cross docking is a logistics technique that involves the direct transfer of products from inbound transport to outbound transport without intermediate storage. This technique is used to reduce storage costs, delivery times and transportation costs. Circular economy, on the other hand, is a sustainable development model that seeks to limit the use of natural resources.

According to (Valencia et al., 2010) to the purpose, a technique called cross-docking has emerged, which uses organizational communication and management tools. To make supply chains more efficient. On the other hand (Sandra L. Rodríguez, April 2019) considers the importance of cross-docking. It is based as an innovative warehouse management strategy, capable of managing high distribution costs while maintaining customer satisfaction.

For the circular economy (Cerdá & Khalilova, 2016) interpret it as follows as conceived by its creators, a circular economy is an active continuous cycle of development that preserves and increases natural capital, improves resource efficiency and reduces systemic risk. This is achieved through reduction, recycling and efficient use of natural resources. The combination of these two strategies allows companies to reduce storage and transportation costs, while ensuring the sustainability of natural resources. According to some authors, cross docking and the circular economy can be an effective solution to increase the competitiveness of companies, reduce logistics costs and improve sustainability.

Another author who shares a similar concept is (Lett, 2014) which is based on the ecological field, proposing a paradigm shift that wants to "Reduce, Reuse, Recycle" and aim for a deeper and more sustainable transformation that reduces the impact of human activities.

The model is decoupled from finite resource consumption and capable of generating resilient economic systems, is increasingly seen as the next wave of development. An unprecedented favorable alignment of technological and social factors is now making possible the transition to a circular economy at scale (MacArthur, 2019).

The concept of a warehouse today is not the same as it was a century ago. (Macias Zamora, 2022) is a service and support department in the organic and functional structure of a commercial or industrial company, with clearly defined functions of containment, protection, handling and even delivery of materials and products. On the contrary, (ALMER, 2020) mentions that a distribution center is a space that brings together infrastructure, people, mobile devices and processes. In order to receive materials finished products from different factories and suppliers, coordinating the balance between supply and demand. In addition, it adds value to the products through logistics operations such as resizing or labeling. Delivering them punctually and promptly according to your requirements.

For example, cross docking allows companies to minimize storage and transportation costs by reducing delivery times and the amount of products stored. In addition, the circular economy enables companies to reduce the use of natural resources by recycling products and minimizing waste. In this way, cross
docking and the circular economy can be an effective way for companies to improve their competitiveness.

**Conclusion**

Cross docking and circular economy are efficient solutions to improve the management and use of business resources. These strategies can reduce storage and inventory management costs, improve resource mobilization, reduce delivery time and improve the overall quality of the products and/or services offered. In addition, these strategies can help companies become more sustainable by allowing resources to be used more efficiently, reducing waste and promoting the reuse and recycling of materials. These strategies can help companies to meet environmental and social objectives set by legislation, and to establish a competitive advantage and increase their profitability.

Cross-docking is becoming a more popular distribution technique as companies continue to optimize distribution processes for several benefits, including less inventory, improved customer responsiveness and better control over the distribution process. Cross-docking systems, by definition, require a close connection between shipping and receiving operations. To make this connection, there must be reliable hardware and software systems.

Eliminating excessive storage and handling is the main objective of a typical cross-docking system. Part of the system risk is reduced through simulation. The article explains how simulation establishes failure strategies before problems occur and determines the best configuration and control of for direct transit systems. Modeling approaches and issues related to cross-docking are also discussed. (Arévalo Hernández & Vera, 2018).

This suggests that the circular economy and cross docking are closely related. The former is used to optimize logistics processes and enable products to move efficiently between different points in the supply chain. This contributes to further waste reduction and better resource management. This contributes directly to the circular economy, as products can be reused and recycled rather than discarded. Cross-docking also enables retailers and other distributors to offer fresher and better quality products, which contributes to the development of a sustainable circular economy.

And the second process as mentioned above reduces the amount of waste produced in the production process, both at the individual and collective level. At the individual level, the concept involves reducing the amount of raw materials and waste produced during the production process. At the collective level, the circular economy refers to the respect of the amount of natural resources used, the maintenance of environmental services, and the efficient use of productive capacities.

It can also reduce the company's environmental impact by enabling the use of renewable resources and the recycling of materials. Cross-docking can also help reduce transportation costs by allowing goods to be transported directly from the supplier to the final destination, without the need for warehousing. In conclusion, the application of cross-docking and the circular economy are useful tools for improving companies’ resource management, ensuring greater efficiency and improved environmental performance. Their use in the management of corporate resources brings numerous benefits to society, increasing efficiency in resource management. These tools also help to better organize production and distribution processes and reduce waste. A circular economy, on the other hand, aims to improve the environment in which companies operate by encouraging recycling and the use of recycled materials.

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