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Abstract

This research aims to analyze the impacts of reverse logistics on supply chain performance. Supply chain management is an operation of the flow of products and services that transform raw materials into semi-finished or finished products. Today, supply chain managers face a large volume of customer product returns, and all of those returns need to be organized or reworked. The returns are usually due to the product warranty, recalls, recycling, and damaged products.

The large volume of customer returns can be one of the causes for the firm to lose money. Reverse logistics can solve the supply chain management issue because it can help accept customers' unwanted or damaged items. Those damaged items can be refurbished and resold on the market. Reverse logistics also help clean the environment from being polluted by the rejected product from consumers.

Reverse logistics is the factor that helps to move products and materials back into the supply chain. Most of the time, it is associated with recycling and returning products. Salif (2022) states that "reverse logistics aims to improve the efficiency of aftermarket transactions while also improving the utilization of the available environmental resources and maximizing profits." Reverse logistics is one of the systems that also help companies to recover their asset.

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Section I: Introduction

Problem statement

Actually, reverse logistics is a new area of operations, and it has gained traction as a profitable and sustainable business strategy that allows organizations to create a competitive edge. Successful implementation of the strategy allows organizations to create cost-saving mechanisms that boost efficiency in the production operation. Yet, there is a need to consider factors such as overall quality, customer satisfaction, environmental sustainability, and legal implications. The process can lead to customer satisfaction as it facilitates faster reimbursement or shipping of repaired goods that have previously been returned for having a flaw.

Additionally, dealing with defects in goods helps increase their quality, markets the organization among clients, and ensures customer loyalty. Zhu and Sarkis (2007) Reverse logistics help to reduce legal costs as it ensures that an organization disposes of its waste materials correctly. In most countries, organizations face legal accountability for the correct disposal or recovery of waste generated from the manufacture or supply of their products. By maintaining accountability in waste disposal, a business also actualizes environmental sustainability.

Reverse logistics may also lead to unplanned profits or reduced losses in business ventures. Before implementing reverse logistics, businesses would face significant losses from failed or returned products. Currently, businesses can repair such products and sell them or scrap their parts and sell them to secondary markets. When implemented effectively, reverse logistics reduces transportation, administrative, and aftermarket support costs. Also, there is a need to gain insights into the overall costs involved in the entire operations, including direct and indirect costs (Demajorovic et al., 2016).

Some hidden costs spring from the reverse logistics process. For instance, an organization may face increased labor costs from workers that deal with customer relations, customer services, transport and shipping, repairs, and warehouse costs. Predicting the range or extent of goods returned is challenging, leading to wasted resources when a company does not have a high inflow of retunes.

Background

Reverse logistics is a strategy that allows moving products back from customer to manufacturer or supplier. Salif (2022) states, “Reverse logistics is the opposite of traditional order fulfillment, although it frequently comes with higher business expenses.”

Today, customers would like to do business with a retailer or manufacturer that allows free returns. If the supplier fails to provide that option, they will probably change it. Eltayeb & Zailani (2009), The need to understand reverse logistics by supply chain managers are important because they need to make sure that they are giving the best practices experience of reverse logistics to customers, or they will lose them forever.

According to Tass Group (2022) “Properly implementing logistics is essential for businesses to stay connected with customers’ demands and stay ahead of competitors.” A good understanding of reverse logistics will help supply chain managers reduce their supply chain costs.

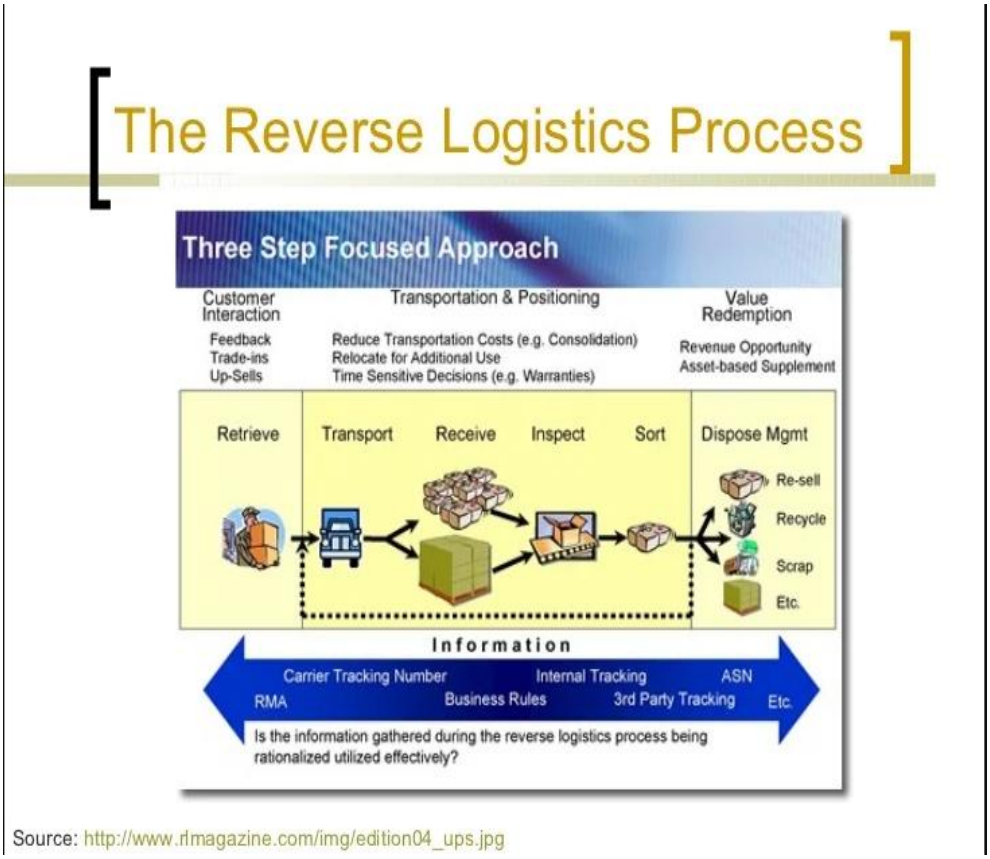
Section II: Literature review and analysis

This literature review will help us understand the fundamentals of reverse logistics and make it easier for our audience to understand our point of view about the subject.

Reverse supply chain or logistics is a process that helps companies to become environmentally efficient through reusing materials, recycling, and reducing the number of materials used. The product return from the customer or end-user to the seller or manufacturer is considered reverse logistics. This also includes the online selling return from customers (Syverson, 2021).

According to Khalili-Damghani et al. (2015), "The majority of the supply chain performance measurement studies in the literature are devoted to forward logistics performance measurement. However, a comprehensive supply chain performance management system should

collectively consider the performance of the reverse logistics and the performance of the supply chain in an integrated framework." In research by Mahmoudi and Fazlollahtabar (2014), "Supply chain management (SCM) is regarded as a means to maximize the overall value generated." The refurbishing and remanufacturing activities may be classified as parts of the reverse logistics process. Based on the product life cycle and reverse logistics definition, the product disposition can be illustrated in figure 1.



According to Afum et al. (2019), "Reverse Logistics has evolved as a significant research interest in the supply chain management literature over the last few decades." The flow of materials, goods, products, and services from suppliers through the distribution process to the end-users is one of the main concerns of the supply chain, Khalili-Damghani et al., (2015). Many authors have categorized reverse logistics as a reverse supply chain process such as product

acquisition, inspection, reverse logistics, production disposition, and product reconditioning (Khor & Udin, 2012). Despite its prominence among logisticians and industrial practitioners, the concept is relatively in its infant stage.

According to Trebilock (2001) and reaffirmed by Khor & Udin (2012), "Reverse logistics can be classified as a series of five operations that start with authorization of product returns, auditing, transportation, and product disposition, and an information system created to track returns."

The environmental regulations have brought companies to turn their interest in reverse logistics innovation (Yoon & Jeong, 2017). Today, the green supply chain has provoked competition between companies and their suppliers or supply chains. In consequence, that obligated companies to enhance the performance of their supply chain system.

"While a supply chain is described as a system of connected and mutually supporting organizations that work together to ensure the successful flow of products to the market, supply chain performance measures the efficiency and effectiveness of a firm supply chain via predetermined yardsticks" (Sillanpää, 2015). To understand the supply chain network design, managers need to know that there are two supply chains with reverse logistics: closed loop and open loop supply chain. According to Keshavarz Ghorabaee et al. (2017), "In a closed-loop supply chain design, recovered products and/or materials are usually reused in the original supply chain, i.e., in the production process of the same supply chain. On the other hand, in an open-loop design, returned products are recovered/recycled and reused in other production processes out of the original supply chain."

Zhu and Sarkis (2007) have conducted a study within the Chinese environment whereby "reverse logistics has been described as investment recovery where sales of used and excess

material or equipment are useful to liquidate assets. However, this interpretation inadequately describes the advantages of green and sustainable activities."

According to Arshinder et al. (2008), "reverse supply chains can use a returns consolidation center, a warehouse specifically for managing reverse flows. The returns consolidation center receives all returns from warehouses and stores. It determines the disposition of the merchandise and plans for the tasks required to complete the execution of the selected disposition method."

Reverse logistics helps companies to save money by accepting a returned product for remanufacturing or selling those returned products as a refurbishing or open box product. The companies can partially reduce the product's original price by implementing reverse logistics in their process, Venkatesh, (2020).

When improving the supply chain's environmental aspect, one fundamental aspect is the recovery of used products by reverse logistics (Keshavarz Ghorabaee et al., 2017). A well reverse logistics implementation will help a company grow its sales, be financially secure, and provide a green supply chain.

Section III: Methodology

The primary approach for this project has been based on adopting the literature review system by reading the previous research papers. Those previous research papers gave us some ideas to explain to our audience the impact of reverse logistics on supply chain performance.

We have also used the published literature to do well in our research paper, including what happens daily in our supply chain. We have used electronic sources such as google scholar and Ebsco to go deeper in our research. Then the utilization of search engines such as Google, Inderscience databases for literature, Emerald insight, Science Direct, and Springer was not

excluded. Of course, I used my previous work to find more understanding for our readers about the topic. These are the keywords that we have used when doing our research on the theme.

- Green supply chain
- Product returns
- Product recovery
- Reverse logistics,
- End-of-life products
- Closed-loop supply chains
- Recycling
- Remanufacturing

All the above keywords have been used to find related literature. The publications were found in the areas of logistics management, production, operations management, business logistics, and supply chain management. Besides those search engines, we have also applied our day-to-day tasks to this research paper. In the last section, we will develop some of the points we found necessary for our audience to understand more about the impact of reverse logistics on supply chain performance. Among these points, we have:

- Operations
- Business performance
- Environmental outcomes
- Profitability
- Product disposition
- Total costs of ownership (TCO)
- Reduce cost

- Improves customer service
- Improve product quality
- Reduction of waste
- Enhances flexibility
- On sale growth

All of the above points will help our readers to understand the pros and cons of the impact of reverse logistics on supply chain performance.

Impact of reverse logistics operations

Reverse logistics has an enormous impact on a company's profitability. One of the goals of reverse logistics is to have a well-ordered supply chain. It also directly impacts the supply chain when customers return their products to the manufacturer or retail store. It does not matter whether the customer has used the product or not. Once the customer returns the product to the store, it will automatically be send to the manufacturer for disposal. Reverse logistics is one of the branches of the supply chain which has been used to take care of the product destined for remanufacturing or disposal, Dowlatshahi, S (2000). The advantage of reverse logistics is that it will help companies properly dispose of return and defective products. Many companies avoid reverse logistics because it asks for a big investment.

Impact of reverse logistics on business performance

Reverse Logistics is one of the fundamental factors of the supply chain that helps to return products from customers back to the manufacturers or to the supplier shop. For example, these products can be damaged, expired, or flawed. According to Khor & Udin (2012), business performance cannot be measured by only a single department because all department in the

organization has different business interests. Reverse logistics impacts business performance differently, including environmental outcomes and profitability.

Environmental outcomes:

Companies are trying to find a way to be environmentally friendly with their supply chain, and reverse logistics shows itself as a green part of supply chain management. This is because reverse logistics take care of any products that can cause damage to the environment.

Firms can reduce environmental damage and air pollution by using a reverse supply chain to eliminate any return that is not efficient and result in a transfer by transportation. Hence, a green environment can be conceived when it does not cost much for another form of green supply.

Reverse logistics help companies have a green environment by simultaneously managing product life cycle (Alnor et al., (2018). Reverse Logistics or reverse supply chains ensure that the level of environmental pollution is diminished. Today, a lot of companies have adopted environmental management in their operations. This system is sustainable and beneficial to everybody since it helps keep the environment clean, and the companies can minimize the cost of the materials. For example, the company I work for just adopted a system to reuse the scrap zinc to make a part instead of selling it to other companies to melt and sell it back to us. By doing that in six months, we save one million dollars for the company, which also helps us to avoid a fine for polluting the environment.

Profitability

Reverse logistics is a program that helps companies recover their assets that might be lost when customers do not return the recycled products. Reverse logistics reduce the company investment in purchasing another material to make a product, satisfy customers, and improve

outcomes if used effectively. Gechevski et al. (2016). Reverse logistics is also a way to increase the firm revenues from the return products and reduce operations costs from reusing recovered items and parts. The returned inventory can also be the way to have a higher asset turnover when it has been managed well.

Impact of reverse logistics on product disposition

The increase in incorrect product recycling has raised researchers and government concern about the destruction of the environment. This concern motivates the government to place rules on companies to adopt a system that reduces hazardous substances, waste, and equipment that harm the environment and also gives those waste products proper disposal, Moraes (2014).

Reverse logistics is a system companies use to recover the return and unsold products, and it also contributes to extending the product lifecycle. Researchers on reverse logistics practices think that a company's management should focus on product disposition as recouping products in whole or subassemblies, components, and materials that will contribute to a prolonged product lifecycle (Khor & Udin, 2012). In my previous work on the impact of reverse logistics on product disposition, I illustrated some of the terms of reverse logistics to make the audience understand that reverse logistics can be adopted in multiple areas inside and outside the company. Among those areas are returned management, unsold products, end-of-life products, rentals and leasing, delivery failure, packaging management, cost savings, customer satisfaction, value goods, sustainability, business insight, and smaller environmental impact.

- Returns management is the process of dealing with returns or avoiding returns that can be solved by the quality and production departments.
- Unsold products: these are the return products from distributors and retailers back to the manufacturers that need to be handled.

- End of life: The care of returned products no longer catches customer attention.
- Rentals and leasing: the refurbishing, repairing, and redeploying of rented equipment that needs to be taken care of.
- Delivery failure occurs when the product has been returned to the manufacturer because the post officer failed to deliver it to the customer.
- In packaging management, the manufacturer can reuse the old packaging to avoid waste.
- The satisfaction of the customer, the fast and easy returns process satisfies the customer
- Value of product: recycled return products are a benefit for manufacturers to increase the product's value.
- Sustainability: Customers have a lot concerned about sustainability. Recycled products accomplish greater sustainability and can strengthen a company's reputation.
- Business insights: sustainable reverse logistics can give valuable and consolidate further operations.
- Smaller Environmental Impact**:** simply discarding returned products is a complete waste. Logistics service providers worldwide are continuing to implement newer and better solutions to lower their carbon footprint and improve their eco-friendliness. As part of a comprehensive supply chain program, reverse logistics will work to reduce your environmental impact.

Impact of reverse logistics on the total cost of ownership

Today, businesses have discovered the importance of managing the total cost of ownership and making sure that the cost of ownership stays low as possible. In a reverse logistics system, when businesses ignore to consider the calculation of the total cost of ownership, they will compromise the actual cost of ownership. For businesses to understand how reverse logistics impacts the total cost of ownership, they need first to implement a system to track the cost for return products (Saran, 2022). When purchasing, businesses should consider reverse logistics in calculating the total cost of ownership.

Reduction of the product cost

Companies can reduce processing costs by accepting returned products or buying recycled components at the lowest price. Those returns or recycled products can be reworked and resold to the customer as a new products.

Improving customer service

Customers like to buy items with a company or retailer they know, and it will be easiest for them to return the unwanted items. These companies with a strong return policy will likely get positive customer reviews. So, the customers are likely to come again.

Improve product quality

Companies can improve their product quality when they receive a returned product from the market. Those return products can help the company evaluate its production process and analyze its failure.

Waste Reduction

Anytime a company accepts returned product such as damaged, recycled product and rework them, this help to reduce waste and give a green environment.

Enhance flexibility

Companies should be flexible in accepting returns and trading products from customers. This action will help companies to get positive feedback from customers. It is also a system to get customers' loyalty toward a retail store or manufacturer.

Impact of reverse logistics on sale growth

Reverse logistics allow manufacturers to improve their product quality and gain better sales. According to Abdullah & Yaakub (2014), "Reverse logistics activities offer benefits to both the customers, companies and even the environment." It can also create a long-term

customer relationship because once customers are comfortable doing business with their suppliers, that leads to sales growth.

Section IV: Recommendation and Conclusion

Recommendation

After our research, we found out it would be necessary to give some recommendations. A reverse logistics strategy can be a good source of asset recovery and product life cycle for the company when applied correctly.

Reverse logistics should be a strategy that all supply chain managers need to focus on it to reduce their production costs and raw materials. Reverse logistics is a process that gives a second chance to the product to be resold as a new one. For example, the return material can be sorted and recycled the valuable component that will be good for building another product. It gives a green environment to the company to do their business properly.

Conclusion

Quality products, customer satisfaction, and a green environment have become the most important challenges for companies. By its definition, reverse logistics shows up as the solution to overcome this challenge. Because reverse logistics allows giving a second chance to the materials that the consumer has rejected, it is the strategy that gives a sustainable environment.

Reverse logistics impact different branches in supply chain management, such as improving product quality, sale growth, waste reduction, customer service, and production costs. So, an excellent implementation of reverse logistics can help the companies to overcome all of those aspects cited above.

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