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The Best Practices for Waste Management in Supply Chain

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Abstract
The idea of waste management in the supply chain, which is a crucial component of sustainable business practices, is the subject of this research study. The various wastes that can occur in the supply chain-including material waste, energy waste, time waste, and information waste-are covered in the paper. It also looks at the different approaches that businesses may take to efficiently manage waste, including the principles of reduce, reuse, and recycle, product design for disassembly, green purchasing, lean manufacturing, and transportation efficiency. The challenges that organizations face in managing waste in the supply chain are also covered in the paper, as well as the advantages of employing efficient waste management techniques, such as lowered environmental impact, increased operational effectiveness, and increased corporate social responsibility. This research paper offers insights into the significance of waste management in the supply chain as well as the approaches that businesses can take to reduce waste and achieve their sustainability objectives to the fullest.

Keywords: Waste Management, Supply Chain, Employment, Conserving Resources

Introduction

Any type of waste created during the creation, processing, distribution, and consumption of goods or services is referred to as supply chain waste. This waste can come in a variety of shapes, including time, energy, and material waste. To guarantee that resources are used effectively, to reduce environmental impact, and to increase economic benefits, supply chain waste management is crucial.

Throughout the supply chain, waste management is another area where technology is vital. For instance, businesses can employ advanced analytics and automation technology to find waste in their processes, use resources more effectively, and enhance product design. IoT-enabled sensors can be used to track waste production and spot areas where waste reduction is possible.

Let us look at what data says in terms of waste across various industrial activities. (UNEP, 2011-13 [2]; World Bank, 2012):

Waste production: Across the world, an estimated 1 billion tons (approx.) of waste, especially solid in nature, are gathered annually. By 2025, this amount is anticipated to rise to 2.2 billion tones, with developing nations accounting for almost all the growth.

Market size: The estimated annual value of the worldwide trash market, from collection through recycling, is 410 billion (USD), excluding the sizeable informal sector in developing nations.

Employment: Recycling activities in the European Union (EU) produced around 2 lakhs of jobs in 2000; by 2008, that number had risen to around 5 lakhs, representing a 10.57% annual growth rate. In Europe, the number of individuals working in waste-related recovery operations climbed from 420 per million people in 2000 to 611 in 2007, a rise of 45%.

Profitability: A tone of electronic (e-waste) and electrical trash contains amounts of copper, aluminum, and metals that are several times higher than those found in ordinary ores. One tone of e-waste also contains amounts of gold equivalent to around 10-12 tons of typical ore of gold. The "possibly one of the richest ore streams, anyone found" is printed circuit boards (Grossman, 2006) [1].

Companies can use a variety of tactics, such as designing items for disassembly, employing sustainable packaging materials, putting lean manufacturing practices into practice, and streamlining logistics and transportation procedures, to control waste in the supply chain successfully. In order to eliminate waste along the entire supply chain, businesses can also work with suppliers and clients. Heidrich's Research has suggested that the boundaries between the environmental and operations management tasks may make it difficult to manage waste effectively.

Using the "reduce, reuse, and recycle" philosophy is one of the best strategies to manage waste in the supply chain. By using fewer materials, reusing things that would otherwise be thrown, and recycling materials to create new goods, this idea aims to

reduce waste. It can assist businesses in making financial savings, resource preservation, and environmental impact reduction. These methods can be used at various production phases. Due to many factors, including customer perceptions of "greening," manufacturers introduced recycling technology throughout the product design phase.

The study by Hicks, Heidrich, McGovern, and Donnelly (2004) came to the conclusion that there can be a lot of obstacles in the way of efficient waste management. They can result from a lack of effective function integration within an organization, especially when environmental management prioritizes process improvement above enacting new laws and regulations.

Literature Review

Due to its substantial effects on the natural, economic and social aspects, waste management in the supply chain has received more attention in recent years. This survey of the literature attempts to give a broad overview of the major ideas and conclusions from studies on waste control in the supply chain.

Peattie (2001) [10] examined the development of marketing and took ecological, environmental, and sustainable marketing into account. Environmental marketing, on the other hand, refers to a larger attempt at minimizing environmental harm by emphasising green consumers. Ecological marketing refers to the specific initiative of reducing consumer dependence on harmful products. In their study on the green consumer segment and green marketing, Bloom and Ginsberg (2004) [11] discovered that for green products to compete favorably with non-green items, they must accord up to conventional product feature. According to A Geda and G Karamemi's research, the level of sustainability of the supply chain waste management should also be considered from the standpoint of the waste management company. In the study by Vici Unite and Alfines (2019) [12], the use of environmentally friendly raw materials in the production stages was found to be a factor of major significance. Sarvary, Atasu, and Van Wassenhove (2008) looked at a situation where a market sector valued both new and remanufactured items equally. Fleischmann (2001) [14] takes into account network of a reverse supply chain with four levels: clients, consolidation centres, plants that make new items, and warehouses that distribute them. Wang (2016) [15] investigated the question of whether remanufacturing tasks in a reverse supply chain should be handled internally by the company or outsourced to a third party (outsourcing). In the instance of a reverse supply chain view, Souza, Ketzenberg, and Guide (2002) [16] offer a paradigm for comprehending both the timing of customer returns and their motivations.

Research Methodology

Finding the ideal supply chain waste management strategies is the research subject. In order to conduct this study, which focuses on supply chain waste management techniques, data will be gathered from secondary sources, such as academic journals, business reports, and case studies. The pursuing databases were looked up: Among the search terms used were "Supply chain waste management," "Waste mitigation," "Supply chain," and "Sustainability in supply chain and production process." UNEP 2011, 2013, World Bank 2012, and Grossman, 2006, p. 217. Various articles, reports and case studies were identified as relevant and will be included in the analysis.

The following criteria were used to evaluate the chosen sources:

- Relevance,
- The writers' credibility of the author,
- The quality of the research methods applied
- The analysis did not include any articles that did not fit these criteria.

The finest waste management strategies in the supply chain and their effects on sustainability were determined through data analysis. The research's themes were found by carefully examining the literature and employing analytical tools to spot patterns and trends.

The analysis and findings indicate that the best practices for the waste management in supply chain includes:

- Responsible waste disposal
- Waste recycling
- Reducing greenhouse gas emissions.
- Waste reuse
- Conserving resources
- Waste reduction

The methodology section above provides a detailed explanation of how the research was carried out and how the data was analyzed to produce the conclusions, enabling readers to judge the validity and dependability of the study.

Conclusion

From the above research, we can conclude that, waste management in the supply chain is essential for businesses to minimize their negative effects on the environment, conserve resources, and profit. Companies can reduce waste and improve their operations by putting the reduce, reuse, and recycle principle into effect, embracing sustainable practices, and utilizing technology.

Many obstacles must be overcome for waste management in the supply chain to be effective, including a lack of knowledge, poor infrastructure, and few financial resources. All parties involved in the supply chain, from product design through disposal, must be included in the forming and implementation of comprehensive waste management policies in order to solve these issues.

According to this study, the supply chain's total waste management process is a complicated one that calls for cooperation from all parties involved. Supply chain firms may reduce their environmental impact, boost their financial performance, and help to create a more sustainable future by putting in place efficient waste management policies. The use of data analytics to locate waste hotspots, the adoption of digital platforms to promote communication and collaboration, and the deployment of sensors and other Internet of Things (IoT) devices to monitor waste and increase efficiency are all examples of how technology can play a major role in management of wastages in the supply chain.

This research also studies the perspective of various other author and literatures who has done similar researches on the topic, to understand their views and ideas.

Overall, efficient waste management in the supply chain is a difficult and constant task that calls for an all-encompassing strategy and a dedication to continued development. Nonetheless, it is a worthwhile attempt for businesses of all sizes and sectors because to the advantages in terms of cost savings, environmental effect, and customer satisfaction.

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