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EVALUATING REVERSE LOGISTICS STRATEGIES AND FIRM PERFORMANCE: EVIDENCE FROM MANUFACTURING UNITS IN COIMBATORE

Mr. Vasanth raj R[1], Dr.C. Rajalakshmi[2], Mr.M. Selva Kumar[3]
[1]MBA Student, Sakthi Institute of Information and Management Studies Pollachi
[2]Associate Professor, Sakthi Institute of Information and Management Studies Pollachi
[3]Assistant Professor, Sakthi Institute of Information Management Studies, Pollachi.

ABSTRACT

Reverse logistics, a critical yet often underutilized component of supply chain management, involves the movement of products and materials from the end consumer back to the origin for reuse, recycling, remanufacturing, or proper disposal. In the context of increasing environmental concerns and sustainability goals, manufacturing firms are recognizing the strategic importance of reverse logistics in enhancing performance. This study aims to investigate the relationship between reverse logistics practices and the overall performance of manufacturing firms in Coimbatore, a prominent industrial city in Tamil Nadu, India.

The research adopts a mixed-method approach, combining both qualitative interviews and quantitative surveys conducted among logistics managers and key decision-makers in selected manufacturing firms. The study examines various aspects of reverse logistics such as return management, product recovery, recycling processes, and waste reduction strategies. Findings indicate that firms with well-integrated reverse logistics systems benefit from reduced operational costs, enhanced customer satisfaction, and improved environmental compliance. Furthermore, reverse logistics contributes positively to brand reputation and competitive advantage.

The research also identifies several challenges that hinder effective implementation, including lack of technical expertise, insufficient infrastructure, limited policy support, and inadequate awareness. Addressing these barriers through strategic investments, government incentives, and workforce training could unlock significant value.

This study concludes that reverse logistics is not just an environmental necessity but a potential driver of business performance and long-term sustainability for manufacturing firms. By embracing reverse logistics, firms in Coimbatore can move toward more resilient, efficient, and responsible supply chains.

KEYWORDS: *Reverse Logistics, Manufacturing Firms, Recycling, Return Management, Environmental Compliance, Operational Efficiency, Competitive Advantage*

OBJECTIVES

- To analyze the role of reverse logistics in improving operational efficiency
- To evaluate the impact of reverse logistics on environmental sustainability
- To identify the challenges faced by manufacturing firms in implementing reverse logistics.
- To examine the relationship between reverse logistics and overall firm performance.

INTODUCTION

In today's competitive and environmentally conscious business landscape, reverse logistics has emerged as a vital aspect of supply chain management. Unlike traditional logistics that focus on product flow from manufacturer to consumer, reverse logistics deals with the movement of goods from the end user back to the manufacturer for returns, repairs, recycling, or proper disposal. With growing pressure on industries to adopt sustainable practices, reverse logistics offers both ecological and economic benefits.

Manufacturing firms, especially in industrial hubs like Coimbatore, are increasingly exploring reverse logistics as a strategy to enhance resource efficiency, reduce operational costs, and meet regulatory requirements. Coimbatore, known for its strong industrial base in textiles, engineering, and automotive components, provides a dynamic setting for analyzing the integration of reverse logistics into manufacturing operations.

REVIEW OF LITERTURE

1. **Aggarwal, Vaneeta. (2020).** This research analyses the major barriers to implementing green logistics in Tamil Nadu's manufacturing sector and statistically ranks the best green logistics practices. The study identifies significant challenges such as high implementation costs, lack of training, lack of top-level management commitment, resistance to new technologies, and a shortage of skilled human resources. Despite these barriers, the research highlights the importance of adopting sustainable practices

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to achieve environmental protection and gain a competitive edge. The findings underscore the need for policy interventions and organizational commitment to overcome these challenges.

2. **Ahmad, Md. Iftekhar, & Mahanty, Adhip Kr. (2023).** This study assesses the economic and environmental benefits of reverse logistics within the Indian context using secondary data. Economically, reverse logistics offers avenues for cost reduction through efficient waste management and creates opportunities for revenue generation from the resale of refurbished products. Environmentally, it promotes recycling, reduces landfill use, and conserves resources, contributing to a decrease in the carbon footprint of businesses. The analysis reveals that companies practicing reverse logistics can achieve up to a 20% reduction in carbon emissions and a 15% cut in logistics costs. The study underscores the need for policy interventions to support reverse logistics, leading to significant economic and environmental improvements in India's supply chain operations.

3. **Kalubanga, M., & Mbekeka, W. (2024).** This study examines how compliance with government and firm's own policies, along with reverse logistics practices, relate to firm environmental performance. Drawing on stakeholder theory, the research utilizes a two-phase approach, including an extended literature review and an empirical study involving 203 food and beverage manufacturing firms in Uganda

The relationship between compliance with government policy and reverse logistics practices is contingent upon compliance with the firm's own policy. This study provides useful insights for logistics and supply chain managers involved in reverse logistics activities, highlighting the importance of policy compliance in enhancing environmental performance.

4. **Tamil Nadu Government (2023)** In 2023, the Tamil Nadu government introduced a Logistics Policy and Integrated Logistics Plan 2023, aiming to promote an integrated, reliable, cost-efficient, and sustainable logistics system in the state. The policy seeks to reduce logistics costs for both export-import and domestic freight, leverage private participation for developing logistics infrastructure, and establish effective coordination mechanisms between state and central agencies. Key initiatives include assessing connectivity gaps in industrial clusters, identifying unutilized factory sheds for logistics activities, and promoting skill development in the logistics sector. While not exclusively focused on reverse logistics, this policy underscores the state's commitment to enhancing overall logistics performance, which can indirectly influence reverse logistics practices.

5. **Ravi, V., & Shankar, R. (2024).** This research explores the dissimilarities among different industrial sectors in implementing common reverse logistics practices. A nationwide questionnaire-based survey was conducted across four sectors of the Indian manufacturing industry: automotive, paper, food and beverage processing, and electronics. Statistical tests such as regression analysis and t-tests reveal that companies in the electronics sector significantly differ from those in other sectors regarding the adoption of reverse logistics practices. The study highlights the importance of sector-specific strategies for effective implementation of reverse logistics programs, considering the unique challenges and opportunities within each industry.

RESPONSE ON ORGANIZATION PRACTICE REVERSE LOGISTICS

	Frequency	Percent	Cumulative Percent
Yes	97	97%	97
No	3	3%	100
Total	100	100 %	

The results indicate that 97% of the firms practices reverse logistics in their operations while only one firm (3%) indicated that it does not practice. Thus, majority of the responding firms employ reverse logistics.

RESPONSE OF SUB-SECTOR IN FIRMS

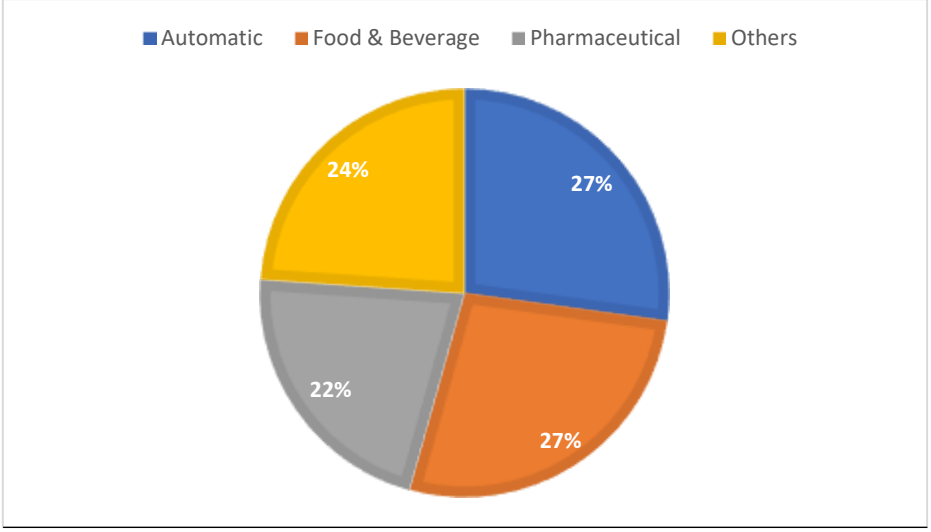
In Coimbatore, various manufacturing sub-sectors have begun integrating reverse logistics to enhance sustainability and efficiency. Textile firms actively manage fabric waste, defective garments, and reuse surplus materials. Automotive component manufacturers utilize reverse logistics for handling warranty returns and remanufacturing damaged parts. Pump and motor companies benefit by refurbishing faulty units and recycling components. Foundries reduce costs through metal scrap recovery and reuse.

Engineering equipment manufacturers implement reverse flows for servicing and retrieving outdated machinery. Electronics firms focus on safe disposal and recovery of valuable components through e-waste initiatives. Plastic manufacturers recycle production waste and manage defective returns effectively. Renewable energy companies apply reverse logistics for recovering worn-out solar panels and turbine parts. Food processing units use it to recall expired products and reuse packaging.

Pharmaceutical companies handle expired or defective drugs through safe return and disposal systems. Printing and packaging industries reuse returned materials to cut costs. Third-party logistics providers support these sectors with specialized reverse logistics solutions. Furniture manufacturers refurbish returned goods for resale. Machinery and tool makers recover defective equipment for repair and reuse. Lastly, chemical manufacturers ensure safe return and recycling of unused chemicals and containers. Together, these sub-sectors demonstrate the growing importance of reverse logistics in improving environmental compliance and operational performance.

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Sub Sectors	Frequency	Percent
Electronics	**30**	**25%**
Automatic	**25**	**20.8%**
Food & Beverage	**25**	**20.8%**
Pharmaceutical	**20**	**16.7%**
Others	**22**	**18.3%**
Total	**122**	**100%**



ESTABLISHMENT OF THE ENVIRONMENTAL MANAGEMENT DEPART

	Frequency	Percent	Valid percent	Cumulative percent
No Impact	3	2.5	2.5	2.5
Yes, But minimally	20	16.7	16.7	19.2
Yes, significantly	97	80.8	80.8	100
Total	120	100.0	100.0	

The dataset presents the distribution of responses regarding the impact of a certain factor on a group of 120 participants. A small portion, just 2.5% (3 respondents), indicated that they experienced no impact from the factor. This suggests that for a very small number of individuals, the factor had no effect. A larger group, comprising 16.7% (20 respondents), reported that the impact was present but minimal, signifying that while the factor did have some influence, it was not substantial.

The majority, 80.8% (97 respondents), felt that the factor had a significant impact, highlighting that the factor in question had a pronounced effect on most of the group. The cumulative percentages show that by the time we reach the "Yes, significantly" category, we have accounted for 100% of the responses, indicating that all participants fall into one of the three impact categories.

The cumulative figures also reveal that 19.2% of respondents reported a minimal impact, and the remaining 80.8% reported significant effects. This distribution implies that the factor under consideration is most impactful for the majority of participants, while only a small fraction experienced no or minimal effects. This insight suggests that if the goal is to address or mitigate the effects of this factor, efforts should focus primarily on the majority who experience significant impact, with minimal concern for those reporting no effect. Further investigation could explore why some individuals feel minimally impacted or unaffected, which could provide additional context for decision-making or interventions.

CONCLUSION

In conclusion, the study highlights the critical role that reverse logistics plays in enhancing the overall performance of manufacturing firms in Coimbatore. As the data and findings suggest, the vast majority of firms (97%) in the region have integrated reverse logistics into their operations, reflecting a growing awareness of its importance in both operational efficiency and sustainability. Reverse logistics, which involves the movement of goods from the end consumer back to the manufacturer for returns, recycling, remanufacturing, or disposal, offers significant environmental and economic benefits. The study demonstrates that manufacturing

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firms are increasingly recognizing these advantages, contributing to their operational optimization, cost savings, and improved environmental compliance.

A key insight from the research is that reverse logistics helps firms reduce operational costs by streamlining return management, recycling, and waste reduction processes. These practices not only improve resource efficiency but also help firms meet the growing demands for eco-friendly operations. For instance, sub-sectors such as automotive, electronics, and pharmaceuticals have been able to optimize their processes by reusing or recycling materials and components, which reduces waste and environmental harm. Moreover, the study found that reverse logistics has a positive impact on the firms' brand reputation, customer satisfaction, and overall competitive advantage, with the majority of firms reporting significant benefits.

However, despite its advantages, the research identifies several challenges in the effective implementation of reverse logistics. These include infrastructural limitations, lack of technical expertise, insufficient awareness, and inadequate policy support. These barriers hinder the full realization of reverse logistics' potential and highlight the need for strategic investments in technology, infrastructure, and workforce training. Additionally, the study suggests that government incentives and policy frameworks could play a vital role in facilitating the widespread adoption of reverse logistics practices, especially in smaller firms that face financial constraints.

Furthermore, the study underscores the need for better awareness and education about reverse logistics, both within the manufacturing firms and in the broader community. Awareness programs, government support, and industry collaborations could address the current gaps and unlock greater value from reverse logistics practices. The research concludes that by embracing reverse logistics, manufacturing firms in Coimbatore can achieve not only environmental sustainability but also enhanced business performance and long-term viability.

In light of the findings, it is recommended that manufacturing firms prioritize the integration of reverse logistics into their supply chains. By doing so, they can position themselves as leaders in sustainability while simultaneously improving their operational efficiency and profitability. Additionally, policymakers should consider enacting supportive regulations that foster the growth of reverse logistics systems across industries. This holistic approach to reverse logistics will enable firms to navigate the challenges of the modern business landscape, reduce their environmental footprint, and build resilient, sustainable supply chains for the future.

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