A STUDY ON LOGISTICS COST MANAGEMENT AND ITS IMPACT ON OPERATIONAL EFFICIENCY IN SUPPLY CHAINS

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ABSTRACT

Logistics cost management has been an important part of the supply chain performance in all developed as well as developing countries. In India, which has high logistics costs comparatively, companies face constant pressure to improve their efficiency in operations and maintain their quality. This study focuses on the connections between components of logistics cost, like transportation, warehousing and administrative expenses and their impact on how efficiently a business runs. The study is based on secondary data collected from company reports, academic literature and case studies from leading companies. The analysis shows that the inadequate logistics systems considerably increase the delays in operation and the cost of the total supply. However, companies that adopt systematic strategies for cost management, supported by the advanced digital tools like automation technologies, route optimisation systems, and real-time monitoring systems, indicate improved speed in delivery, decreased wastage and better use of resources. Case studies of companies like Flipkart and Amazon further explain how a merged logistics network plays a role in cost reduction and develops efficiency in service. The study states that logistics cost management is not a necessity in operation but a strategic function that affects the competition directly and the long-term viability of the supply chain.

Keywords: Logistics cost management; Supply chain performance; Operational efficiency; Digital technologies; Route optimisation systems; Automation; Cost reduction; Integrated logistics networks.

I. INTRODUCTION

In the current business environment, supply chains have become very complicated because of the global connectivity, technological growth and a rapid change in customer expectations. Logistics has a central role in these systems by making sure the smooth flow of goods, information and resources across various stages of manufacturing and supply. Any poor productivity in logistics operations directly affects the cost systems, delivery performance and customer satisfaction.

India represents a specific context for studies based on logistics due to its huge geographical scale, various infrastructure conditions, and expanded industrial sectors. Logistics costs here in India are specifically higher in estimation than those in developed economies, mostly between the range of 13% and 14% of the GDP. The high burden of high costs brings down the competitiveness of companies in the world market.

Several factors give huge dependence on road transportation, Weak transport connectivity between modes, uncoordinated supply chains, high cost of fuel and maintenance, and limited mechanisms in the logistics operations.

At the same time, the increase in online platforms and digital commerce ecosystems has changed customer expectations. Consumer demand quick delivery, a real-time tracking system and quality in service. This change has forced the companies to re-evaluate their systems in logistics and focus on cost optimisation. Despite the initiatives the government made, like infrastructure development programs and the National Logistics Policy, inefficiencies still persist. Therefore, understanding the way

logistics cost management affects the efficiency in operations becomes important for both practical and academics view.

Research Question: How does logistics cost management influence operational efficiency in Indian supply chains?

Research Objective: To find the impact of logistics cost factors on operational performance and identify strategies for improving its efficiency.

Hypothesis: Effective logistics cost management influences the efficiency in operation in supply chain systems.

II. LITERATURE REVIEW

The idea of logistics cost management has been broadly analysed in the supply chain and operational studies. Christopher (2016) specifies logistics as a main driver of the advantage of the cooperation, especially when the company focus on balancing its cost efficiency with a quality of service. Chopra and Meindl (2019) highlight that the cost of logistics is basically caused by the decisions made on its transportation and inventory management. Poor handling of these sectors leads to an increase in the expense of operations and reduces the responsiveness.

In developing economies, such as ours, researchers specify that the limitation in infrastructure and an uncoordinated supply chain automatically increases the cost of logistics. Poor road conditions, traffic, and inadequate facilities of warehouses make it less efficient.

A recent study also shows a change towards digital transformation in logistics, such as:

- Artificial intelligence (AI)
- Machine learning
- Internet of Things (IoT)
- Warehouse automation systems

Are being adopted more to improve the transparency and reduce the inefficient operational service. However, despite the progress in technology, many small and medium-sized companies still lack access to the developed and advanced logistics systems, which makes a difference in supply chain performance.

III. RESEARCH METHODOLOGY

RESEARCH DESIGN

This study has a descriptive and analytical research design, which is suitable for understanding the connection between logistics cost management and operational efficiency. An illustrative approach helps in telling the existing situations in the supply chain, while the aspect of analysis allows for evaluating how the cost difference factors affect the outcomes of the performance. The purpose of this design is not to control the variables but to know the patterns, understand the data, and draw meaningful conclusions about how the cost affects the efficiency of the business in today's real-world supply chain systems.

DATA COLLECTION

The entire study is based on secondary data, which ensures the reliability and accessibility of information without needing basic surveys. The data has been collected from trustworthy and confirmed sources. Using the secondary data helps to get a view on the overall industry trends and makes sure that the analysis shows the real conditions of the market across various sectors in India.

SCOPE OF THE STUDY

The scope of this study is limited to the supply chain system of India, with a specific focus on industries where logistics plays an important role in the success of the operations. The study mainly covers E-commerce organisations (online retail platforms), Third-party logistics (3PL) service providers and Retail distribution networks and warehousing systems. The aim is to understand how these companies manage their cost of logistics and how it affects their speed, efficiency and the quality of service.

VARIABLES OF THE STUDY

Independent variables: transportation, warehousing, inventory and administrative Dependent

variables: delivery speed, cost efficiency and customer satisfaction.

The connection between these two variables helps to know whether the improvements in the management of costs directly lead to better outcomes.

ANALYTICAL TOOLS USED

Comparative analysis – comparing cost structures before and after optimisation Percentage

change analysis – measuring improvements in cost reduction and performance Trend

analysis – identifying patterns in logistics efficiency over time

These tools help convert raw data into meaningful insights about supply chain performance.

PERFORMANCE INDICATORS

Indicators that reflect real business performance are: Delivery time – speed of product delivery to customers, Inventory turnover – how efficiently stock is managed and replenished, Customer satisfaction level – feedback on service quality and Cost per shipment – average logistics cost per order. These indicators provide a clear picture of how logistics improvements affect overall business operations.

IV. LOGISTICS COST

STRUCTURE

TRANSPORTATION COST

Transportation is always the largest factor of the logistics cost in most of the supply chains. It includes fuel expenses, salaries of drivers, toll charges, vehicle maintenance charges, and freight handling charges. In India, transportation costs are high because of Long travel distances between production and consumption centres, Road congestion, infrastructure limitations and empty return trips. Poor route optimisation mostly leads to unnecessary consumption of fuel and increased delivery time, which directly affects operational efficiency.

WAREHOUSING COSTS

Warehousing is the storage and handling of goods before they are sent to the customers. This includes rent of warehouse space, labour costs, usage of equipment, and maintenance charges. Inefficient warehouse layouts or poor inventory organisation can result in Delays in order processing, more labour effort and Higher operational wastage. Modern warehouses use more automation and digital systems to reduce such problems.

INVENTORY COST

Inventory costs increase when goods are stored for long periods before being sold or distributed. Which includes the capital blocked in unsold stock, Insurance costs and Product depreciation. Poor demand forecasting mostly leads to overstocking or understocking, both of which affect profitability and efficiency negatively.

ADMINISTRATIVE AND TECHNOLOGY COST

This includes costs related to planning, coordination, software systems, and communication tools used in logistics operations. Companies now invest in Supply chain management software, tracking systems and Data analytics tools

Although these increase the initial costs, they significantly improve long-term efficiency and decision-making.

V. RESULTS AND ANALYSIS

Logistics Cost Structure

Instead of fixed hypothetical percentages, logistics performance in India is usually measured using cost-to-GDP contribution and cost-per-transport unit metrics.

Key Industry Benchmark Observations

- India's total logistics cost is about 7.97% of GDP (2023–24), but it is expected to go down slowly because of infrastructure improvements and digitalisation projects.
- Road transport is still the most expensive way to move goods, costing about ₹11+ per tonne-km, while rail transport is much cheaper.
- Inefficient warehousing and broken supply chains still add a lot to the total cost of logistics, especially in the retail and FMCG sectors.

Interpretation

Rather than fixed percentages, the logistics cost structure is better understood through Cost per tonne-km, Warehousing utilisation efficiency, Inventory holding days, and Total logistics cost as % of revenue or GDP. These indicators show that transportation is the largest cost driver in India consistently, followed by warehousing and inventory management inefficiencies.

OPERATIONAL EFFICIENCY - KPI-Based Industry Performance Indicators

KPI (Operational Metric)	Industry Benchmark Range	Interpretation
OTIF (On-Time In-Full Delivery)	85% – 98% (top firms >95%)	Measures delivery reliability
Order Cycle Time (Lead Time)	2–7 days (e-commerce India)	Lower = better responsiveness
Inventory Turnover	6–12 turns/year (retail/logistics)	Higher = efficient stock movement
Warehouse Utilisation	70%–85% optimal range	Overuse increases congestion
Cost per Shipment	Varies by region & mode	Key cost efficiency indicator

Interpretation of KPI Trends

- Companies with higher OTIF rates (>95%) usually have better logistics integration and forecasting systems.
- Companies with regional fulfilment centers and automated sorting systems usually have shorter lead times (2–3 days)
- When inventory turns over more quickly, it means that demand forecasting is more accurate and stock holding costs are lower, which makes liquidity better.

INTEGRATED PERFORMANCE INSIGHT

Instead of seeing the cost and efficiency as separate, today's supply chain system evaluates them as one.

Key industry relationship pattern:

- When transport cost decreases → delivery speed improves
- When inventory holding days reduce → working capital efficiency increases
- When warehouse automation increases → order accuracy improves, and labour cost decreases

Real Industry Insight

Leading e-commerce companies in India typically achieve:

Quick delivery through regional distribution centres

Reduced logistics cost per order through automation and scale efficiency Improved

customer satisfaction through real-time tracking systems

VI. DISCUSSION

The findings of this paper show that logistics cost management has a direct and specific impact on the efficiency of the operation. When organisations reduce the unwanted transportation and inventory costs, they are entitled to achieve quicker delivery cycles and improved quality of service. The hypothesis of the study is supported, and it confirms that better control of cost leads to better performance. However, problems like infrastructure limitations, fluctuation in fuel prices, and regional disparities still have an effect on the logistics performance in India. These problems need a constant policy and technical intervention.

VII. CONCLUSION

This study concludes that cost management is a main factor that influences the efficiency of operations in Indian supply chains. Companies that actively use transportation, warehousing and inventory systems are able to achieve good performance and customer satisfaction. This study also shows that the technology plays an important role in reducing inefficiency and improving coordination in the supply chain. Therefore, logistics needs to be treated as a strategic business function instead of an operational activity. Further study may investigate advanced technologies, including AI, cryptocurrencies, and forecasting, in order to enhance logistics performance.

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