ISSN (ELECTRONIC): 2945-3135

N Amsaveni, Antony Roshan A. (2026), *Integrated Logistics Cost Analysis and Optimization: A Data-Driven Study of REVATHI Equipment India Ltd. International Journal of Multidisciplinary Research & Reviews, Vol. 5, Special Issue-1, pp. 92-99.*

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH & REVIEWS

journal homepage: www.ijmrr.online/index.php/home

INTEGRATED LOGISTICS COST ANALYSIS AND OPTIMIZATION: A DATA-DRIVEN STUDY OF REVATHI EQUIPMENT INDIA LTD

Dr. N. Amsaveni[1] & Mr. Antony Roshan. A[2]

[1]Associate Professor, Department of MBA Sri Ramakrishna College of Arts & Science, Coimbatore, TN, India.

[2]Student, Department of MBA Sri Ramakrishna College of Arts & Science, Coimbatore, TN, India.

How to Cite the Article: N Amsaveni, Antony Roshan A. (2026), *Integrated Logistics Cost Analysis and Optimization: A Data-Driven Study of Revathi Equipment India Ltd. International Journal of Multidisciplinary Research & Reviews, Vol. 5, Special Issue-1, pp. 92-99.*

https://doi.org/10.56815/ijmrr. v5.si1.2026.92-99

Keywords

logistics cost, cost optimization, data analytics, fleet utilization, regression analysis, manufacturing logistics, preventive maintenance, route efficiency.

Abstract

The study titled "Integrated Logistics Cost Analysis and Optimization: A Data-Driven Study of Revathi Equipment India Ltd." investigates the significance of logistics cost management in enhancing operational efficiency and profitability within the manufacturing sector. Logistics is a critical function that bridges production and customer delivery, and its cost efficiency determines the overall competitiveness of an organization. The research primarily focuses on identifying key cost determinants—such as trip volume, vehicle type, distance travelled, and fleet utilization—and evaluates their influence on total logistics expenditure.

Using secondary data collected from the logistics department of Revathi Equipment India Ltd. for the financial year 2023–2024, the study applies various statistical tools, including correlation, ANOVA, and regression analysis, to examine cost behaviour and operational trends. The results indicate a strong positive correlation between distance and total cost ($r = 0.87$) and a significant variation in cost across different vehicle types ($p < 0.01$). Seasonal trends reveal fluctuating cost patterns, peaking during high-demand months.

The research concludes that through data-driven decision-making,

N Amsaveni, Antony Roshan A. (2026), *Integrated Logistics Cost Analysis and Optimization: A Data-Driven Study of REVATHI Equipment India Ltd. International Journal of Multidisciplinary Research & Reviews, Vol. 5, Special Issue-1, pp. 92-99.*

	preventive maintenance programs, and route optimization strategies, the company can achieve a 10–12% reduction in annual logistics costs. The study emphasizes that integrating data analytics into logistics operations enhances cost predictability, improves vehicle utilization, and contributes to sustainable competitive advantage.

1. INTRODUCTION

In the current era of globalization and industrial competitiveness, logistics plays a pivotal role in determining the success and sustainability of manufacturing organizations. It is not merely a support function but a strategic enabler that directly influences cost efficiency, service quality, and customer satisfaction. Logistics management encompasses the systematic planning, implementation, and control of the efficient movement of raw materials, semi-finished components, and finished goods from the point of origin to the point of consumption.

For a manufacturing company like Revathi Equipment India Ltd. (REIL)—a leading producer of drilling machinery and industrial equipment—the logistics process involves managing complex transportation networks, handling heavy loads, and maintaining time-sensitive deliveries. As the company caters to both domestic and international markets, logistics costs constitute a substantial portion of its operational expenditure. These costs are influenced by multiple factors, including distance, fuel consumption, vehicle maintenance, route design, and load capacity utilization.

In today's competitive environment, where profit margins are under pressure, the need to analyze and optimize logistics costs has become a priority. Traditional cost control methods often rely on intuition or historical experience, which may not reflect real-time operational efficiency. However, with the advent of data analytics and digital transformation, logistics management is now moving toward a more scientific, data-driven approach.

By employing quantitative techniques such as correlation, regression, and ANOVA, this study seeks to understand the intricate relationship between various logistics cost factors and identify areas where optimization can yield measurable benefits. Furthermore, it recognizes the seasonal fluctuations in demand and their direct impact on fuel consumption, vehicle deployment, and cost variability.

Another dimension explored in this study is fleet utilization efficiency. Optimal vehicle usage ensures reduced idle time, controlled maintenance costs, and balanced workload distribution across the fleet. Inefficiencies such as underutilization of heavy vehicles or overuse of light vehicles can lead to higher per-kilometre expenses and increased wear and tear.

The integration of preventive maintenance schedules, route optimization software, and predictive analytics can transform logistics into a proactive function rather than a reactive one.

This research emphasizes the importance of leveraging data analytics not just to monitor costs but to anticipate inefficiencies, improve performance, and make informed strategic decisions.

N Amsaveni, Antony Roshan A. (2026), *Integrated Logistics Cost Analysis and Optimization: A Data-Driven Study of REVATHI Equipment India Ltd. International Journal of Multidisciplinary Research & Reviews, Vol. 5, Special Issue-1, pp. 92-99.*

Ultimately, this study aims to provide actionable insights that enable Revathi Equipment India Ltd. to enhance its logistics performance, minimize cost inefficiencies, and establish a robust framework for long-term sustainability. The results and interpretations presented in this article highlight how data-based logistics management can become a core driver of operational excellence in manufacturing industries.

2. OBJECTIVES OF THE STUDY

1. To analyze the logistics cost structure and identify key cost drivers.
2. To assess the relationship between distance, vehicle type, and total trip cost.
3. To evaluate fleet utilization efficiency and seasonal demand fluctuations.
4. To provide data-supported recommendations for cost reduction.

3. REVIEW OF LITERATURE

Christopher, M. (2016) in his work "Logistics and Supply Chain Management" emphasized the integration of transportation, warehousing, and inventory management to achieve total cost efficiency. He introduced the concept of the Total Cost Framework, which balances service level and cost optimization through cross-functional coordination.

Kamble, S. & Gunasekaran, A. (2018) explored the impact of Industry 4.0 technologies such as IoT, AI, and cloud-based monitoring on Indian logistics. They concluded that digital transformation significantly improves route accuracy and predictive maintenance scheduling.

Mishra, P. & Sharma, D. (2020) examined logistics cost patterns in Indian manufacturing and revealed that underutilized vehicles and inefficient route design increase per-kilometre expenses by 10–15%. They proposed simulation-based trip planning to minimize redundancy.

Lee, H.L. (2020) discussed digital transformation in logistics, showing that the integration of analytics dashboards and GPS tracking enhances cost transparency and improves decision- making efficiency.

Rajesh, R. (2022)5 conducted a cost structure analysis in South Indian manufacturing firms, demonstrating that preventive maintenance and periodic vehicle rotation improve cost control and reduce breakdown-related losses.

4. RESEARCH DESIGN

This study uses a descriptive and analytical research design, based on secondary data collected from Revathi Equipment India Ltd. for the financial year 2023–2024.

Tools Used: Microsoft Excel for tabulation and graphs; SPSS for statistical analysis including correlation, ANOVA, and regression.

Statistical Methods: Descriptive statistics, correlation analysis, ANOVA, and regression.

N Amsaveni, Antony Roshan A. (2026), *Integrated Logistics Cost Analysis and Optimization: A Data-Driven Study of REVATHI Equipment India Ltd. International Journal of Multidisciplinary Research & Reviews, Vol. 5, Special Issue-1, pp. 92-99.*

5. DATA ANALYSIS AND INTERPRETATION

Table 1: Correlation between Distance and Total Cost

Variables	Distance (km)	Total Cost (₹)
Distance (km)	1.000	0.87**
Total Cost (₹)	0.87**	1.000

Interpretation:

The correlation coefficient (r = 0.87) indicates a strong positive relationship between trip distance and total cost. This means that as the distance increases, logistics cost increases proportionally. The result validates the company's costing model and confirms that trip distance is the primary determinant of logistics expenditure. Such predictability enables better cost estimation, budgeting, and future planning.

6. STATISTICAL TOOL USED FOR ANALYSIS

Table 2: Vehicle Type vs. Average Trip Cost (ANOVA Analysis)

Purpose: Shows cost variation between different vehicle types and proves statistical significance.

Vehicle Type	Average Cost per Trip (₹)	Standard Deviation	No. of Trips
Tata Ace	10,200	1,250	25
Swaraj Mazda	12,750	1,540	30
Eicher	14,890	1,880	35
Ashok Leyland	17,420	2,100	31

ANOVA Result: F = 24.6, p < 0.01

Interpretation:

There is a significant difference in logistics cost among vehicle types. Heavier vehicles such as Ashok Leyland incur higher trip costs due to longer distances and greater load capacity.

This confirms that vehicle selection impacts total logistics expenditure and can be optimized according to route type and cargo volume.

Table 3: Monthly Logistics Cost Trend (Descriptive Statistics)

Purpose: Illustrates cost variation and identifies seasonal peaks.

Month	No. of Trips	Total Cost (₹)	Average Cost per Trip (₹)
April 2023	45	4,86,000	10,800

N Amsaveni, Antony Roshan A. (2026), *Integrated Logistics Cost Analysis and Optimization: A Data-Driven Study of REVATHI Equipment India Ltd. International Journal of Multidisciplinary Research & Reviews, Vol. 5, Special Issue-1, pp. 92-99.*

June 2023	52	5,90,000	11,300
August 2023	68	7,80,000	11,470
October 2023	74	8,96,000	12,100
December 2023	48	5,32,000	11,080
February 2024	41	4,35,000	10,610

Interpretation:

The highest logistics expenditure occurs during September–October, corresponding to peak demand periods. The lowest costs occur in February, reflecting seasonal demand fluctuations. This pattern highlights the need for better resource planning and cost forecasting during busy months.

Table 4: Fleet Utilization Efficiency

Vehicle Type	Available Days	Operational Days	Utilization (%)
Tata Ace	26	24	92%
Swaraj Mazda	26	21	81%
Eicher	26	18	69%
Ashok Leyland	26	16	61%

Interpretation:

The utilization rate of lighter vehicles (Tata Ace) is highest, while heavier ones (Ashok Leyland) show lower utilization due to longer repair cycles and higher idle time. Improving scheduling and preventive maintenance can increase efficiency and reduce cost per trip.

Table 5: Regression Summary for Cost Prediction

Predictor Variable	Coefficient (β)	Std. Error	t-value	Significance (p)
Constant	3,200.45	450.22	7.11	0.000
Distance (km)	14.26	1.94	7.34	0.000
Vehicle Type (code)	1,050.37	320.85	3.27	0.002

Model Summary: $R^2 = 0.76$

Interpretation:

Distance and vehicle type together explain 76% of the variation in logistics cost, confirming that cost increases with longer routes and larger vehicles. This regression model can be used to predict trip cost and plan budget allocations more accurately.

N Amsaveni, Antony Roshan A. (2026), *Integrated Logistics Cost Analysis and Optimization: A Data-Driven Study of REVATHI Equipment India Ltd. International Journal of Multidisciplinary Research & Reviews, Vol. 5, Special Issue-1, pp. 92-99.*

7. FINDINGS

1. The correlation analysis ($r = 0.87$) shows a strong positive relationship between distance and total logistics cost, proving that trip distance is the primary cost determinant.
2. The ANOVA test ($F = 24.6$, $p < 0.01$) reveals significant variation in cost among vehicle types, with heavier vehicles such as Ashok Leyland showing the highest average trip cost due to greater load capacity and longer routes.
3. The monthly trend analysis highlights a seasonal cost pattern, where expenses peak in September–October and decline in February, reflecting demand-driven fluctuations.
4. Fleet utilization data indicates inefficient vehicle deployment—lighter vehicles (Tata Ace, Swaraj Mazda) operate above 80% utilization, while heavier vehicles remain idle nearly 40% of the time.
5. The regression model ($R^2 = 0.76$) confirms that distance and vehicle type together explain 76% of logistics cost variance, demonstrating a reliable predictive relationship for cost estimation.
6. Preventive maintenance delays and uneven scheduling contribute to downtime and additional operational costs during high-demand periods.
7. The company has an opportunity to improve logistics planning through data-based cost forecasting, route optimization, and fleet balancing.

8. SUGGESTIONS

- Implement data-driven logistics planning: Use regression and seasonal trend data to forecast demand and allocate vehicles efficiently across months.
- Enhance preventive maintenance systems: Schedule maintenance cycles based on trip data to reduce breakdown frequency and idle costs.
- Adopt route optimization and tracking tools: Use GPS and analytics software to identify the most fuel-efficient routes and minimize distance-based cost inflation.
- Balance fleet utilization: Rotate vehicle assignments periodically to avoid overuse of lighter fleets and underuse of heavy-duty vehicles.
- Establish performance dashboards: Create digital monitoring systems using Excel/SPSS to track monthly cost per kilometer, utilization rates, and maintenance intervals.
- Incorporate driver performance metrics: Link fuel efficiency and trip accuracy with driver rewards to encourage cost-conscious driving behavior.
- Collaborate with third-party carriers during peak seasons: Outsource limited trips during high-demand months to avoid internal strain and excessive fuel costs.

N Amsaveni, Antony Roshan A. (2026), *Integrated Logistics Cost Analysis and Optimization: A Data-Driven Study of REVATHI Equipment India Ltd. International Journal of Multidisciplinary Research & Reviews, Vol. 5, Special Issue-1, pp. 92-99.*

9. CONCLUSION

The study concludes that effective logistics cost management plays a pivotal role in improving the overall operational efficiency of Revathi Equipment India Ltd. Statistical analysis confirms that logistics cost is primarily driven by trip distance and vehicle type, while seasonal fluctuations and uneven fleet usage further influence total expenditure.

By adopting a data-driven approach—including predictive cost modelling, route optimization, and preventive maintenance—the company can achieve an estimated 10–12% annual reduction in logistics cost. Moreover, developing integrated logistics dashboards and performance monitoring tools will promote transparency, timely decision-making, and sustainable growth.

10. AUTHOR(S) CONTRIBUTION

The writers affirm that they have no connections to, or engagement with, any group or body that provides financial or non-financial assistance for the topics or resources covered in this manuscript.

11. CONFLICTS OF INTEREST

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

12. PLAGIARISM POLICY

All authors declare that any kind of violation of plagiarism, copyright and ethical matters will take care by all authors. Journal and editors are not liable for aforesaid matters.

13. SOURCES OF FUNDING

The authors received no financial aid to support for the research.

REFERENCE

[1] Christopher, M. (2016). Logistics & Supply Chain Management (5th Ed.). Pearson Education.

[2] Kamble, S., & Gunasekaran, A. (2018). Industry 4.0 and Logistics Optimization in Indian Manufacturing.

[3] Mishra, P., & Sharma, D. (2020). Cost Structure Analysis in Indian Transport Logistics Networks.

[4] Lee, H. L. (2020). Digital Transformation and Logistics Cost Efficiency. Journal of Operations & Information Systems.

N Amsaveni, Antony Roshan A. (2026), *Integrated Logistics Cost Analysis and Optimization: A Data-Driven Study of REVATHI Equipment India Ltd. International Journal of Multidisciplinary Research & Reviews, Vol. 5, Special Issue-1, pp. 92-99.*

[5] Rajesh, R. (2022). Preventive Maintenance and Logistics Cost Optimization in South Indian Manufacturing.