International Journal of Scientific Research and Engineering Development-– Volume 9 Issue 1, Jan-Feb 2026
Available at www.ijsred.com

RESEARCH ARTICLE OPEN ACCESS

Freight Cost Management and Optimization Strategies in Small and Medium Engineering Enterprises: A Study in Coimbatore District

[1]Dr.V. Saranya, [2]Karthikeyan.M, [3]Abinaya.M. S
[1]Associate Professor, Department of International Business, Dr.N.G.P Arts and Science College, Coimbatore-48, saranya.v@drngpasc.ac.in.
[2]Student, II nd M. Com International Business, Department of Commerce International Business, Dr.N.G.P. P Arts and Science College, Coimbatore-48, karthi636956@gmail.com.
[3]Student, M. Com, Sri Ramakrishna College of Arts and Science, Coimbatore-48

----------**********----------

Abstract:

Freight cost optimization has become a critical concern for engineering good SMEs due to rising transportation charges, fuel price fluctuations and increasing services expectations. This study investigates the key logistics factors influencing freight cost optimization among SMEs in Coimbatore. Freight cost optimization is treated as the dependent variables while transportation mode selection, shipment consolidation, route planning and network design, carrier selection and contract management and packaging and load optimization are considered as independent variable. Data is collected through a structured survey from engineering goods SMEs and analysed using statistical methods to examine the relationship between logistics practices and cost performance. The results highlight that SMEs adopting structured route planning, effective shipment consolidation and strategic carrier contract managements achieve better cost control and delivery efficiency. The study contributes by offering a practical cost optimization framework for SMEs and supports the need for improved logistics planning and technology adoption in regional manufacturing clusters

Keywords — Freight Cost Optimisation, SME, Engineering Goods, Transportation Mode Selection, Shipment Consolidation, Route Planning and Network Design, Carrier Selection and Contact Management, Packaging and Load Optimisation

----------**********----------

I INTRODUCTION

Small and medium enterprises (SME) play an important role in manufacturing sector especially in industrial hubs like Coimbatore which is widely recognised for engineering goods production. These SME's supports regional economic groups and supply chain development, but they face major operation challenges in managing logistics and transportation cost in recent years, freight cost has become a critical concern due to rise in fuel price, fluctuating transport charges, higher toll expenses, and increase in customer expectations for faster and reliable delivery.

II OBJECTIVES:

- To examine the freight cost management practices adopted by small and medium engineering enterprises in Coimbatore District.
- To analyse the impact of logistics planning, route optimization, and shipment consolidation on freight cost efficiency.
- To evaluate the influence of carrier selection, contractual agreements, and packaging strategies on freight cost optimization.

III LITERATURE REVIEW:

Dr. R. Suresh (2024) highlighted key cost reduction strategy in export and import supply chains, emphasizing multimodal transportation, route optimisation and efficient warehouse management. The study stressed the importance of digital technologies of AI, IOT, Big data analytics, blockchain, and cloud system in improving real-time tracking visibility, and operation efficiency. Collaboration with freight forwarders and 3PL providers was identified as a major factor in reducing logistics cost and improving supply chain and sustainability.

Moon and Monaha Chowdhury (2023) studies logistics practices at Berger Paints Bangladesh Limited. The focus was on reducing delivery led time, and optimising freight costs. The study highlighted operational challenges and suggested better logistics planning for improvement.

Mathias Saeterbo (2023) examine Metal Additive Manufacturing to improve SME's supply chains and resilience. The study found the decentralised production and proper facility location reduce lead time and support cost efficiency.

STATEMENT OF PROBLEM:

Engineering goods SME's plays a vital role in industrial growth but face significant freight cost challenges due to rising fuel price and fluctuating transport rates. As freight forms a major portion of logistics expenses in efficient practices reduce profitability and competitiveness. Many SME's lack structure evaluation of key logistics factor such as transportation, consolidation, route, carrier selection and packaging. Analysing these practices is essential for effective freight cost optimisation and improved logistics performance.

RESEARCH METHODOLOGY:

RESEARCH DESIGN:

This study follows a descriptive and analytical research to examine the logistic factor influencing freight cost optimisation among engineering goods SMEs in Coimbatore.

SOURCE OF DATA:

Primary Data: collecting through a structed questionnaire

Secondary Data: collected from journals, research papers.

SAMPLE SIZE:

A sample size of 105 respondents.

DATA ANALYSIS

- SIMPLE PERCENTAGE ANALYISS
- FACTOR ANALYSIS
- RANKING ANALYSIS
- ANOVA

ANALYSIS AND INTERPRETATION

TABLE SHOW THE SIZE OF THE ORGANIZATION

S.NO	SIZE OF THE ORGANIZATION	NO OF RESPONDENTS	PERCENTAGE
1	Micro enterprise	34	32.4
2	Small enterprise	49	46.7
3	Medium enterprise	22	21.0
	TOTAL	105	100.0

INTERPRETATION

The table show small enterprises constitute the largest share of respondents (46.7%), followed by micro enterprises (32.4%), while medium enterprises represent (21.0%). overall, the results indicates that most of respondent are in small enterprises.

THE TABLE SHOW HOW LONG COMPANY BEEN IN OPERATION

S.NO	PARTICULAR	RESPONDENT	PERCENTAGE
1	less than 5 years	29	27.6
2	5 - 10 years	43	41.0
3	more than 10 years	33	31.4
	Total	105	100.0

INTERPRETATION

The table show the majority of respondent (41.0%) have been in operation for 5 – 10 years, suggesting they are in a growth phase. Additionally, (31.4%) have over 10 years of experience, indicating a substantial number of well-established firms, while 27.6% are relatively new businesses operating for less than five years.

FACTOR ANALYSIS

Rotated Component Matrix[a]

VARIABLES	Component 1	2	3	4	5	6
Efficient packaging practices help in maximizing load utilization.	.803					
Selecting reliable carriers helps in achieving freight cost optimization.	.761					

The transportation mode selected by our organization helps in minimizing freight costs.	.725					
Our organization has achieved significant improvement in freight cost efficiency.	.707					
Planned routes are followed to minimize distance and fuel consumption.	.561					
Consolidation of shipments has helped in better utilization of vehicle capacity.		.774				
Effective route planning has contributed to lower transportation costs.		.769				
Shipment consolidation is regularly practiced to reduce overall freight costs.		.581				
Load optimization reduces the number of trips and overall freight cost.			.701			
The current freight management practices are cost-effective.			.670			
Long-term contracts with carriers have resulted in cost savings.			.656			
Effective contract management reduces unexpected freight-related expenses.			.604			
Packaging design is regularly reviewed to reduce freight cost inefficiencies.				.708		
Freight cost optimization has improved competitiveness in the market.				.669		
Performance monitoring of carriers helps in controlling freight costs.				.645		
Use of route optimization tools has helped in reducing freight expenses.				.596		
Improved packaging practices have reduced damage-related freight costs.					.687	
Shipment consolidation has reduced the freight cost per unit of engineering goods.					.642	
Cost considerations are given higher priority than speed while selecting transportation modes					.612	
Coordination among departments supports efficient shipment consolidation.					.622	
Network design decisions such as warehouse location impact freight cost optimization.						.682
The flexibility of transportation modes used helps in optimizing freight costs.						.555
Freight cost optimization has positively impacted overall profitability.						.515
Choosing the right transportation mode improves cost efficiency without affecting delivery timelines						.514

INTERPRETATION

Factor analysis was performed to identify the key determinants of freight cost efficiency. The KMO value (0.846) and significant Bartlett's Test ($p = 0.000$) indicate that the data are suitable for analysis. All variables showed communalities above 0.50, confirming adequate representation. Six

factors with eigenvalues greater than 1 were extracted, explaining 66.35% of the total variance. Varimax rotation organized the variables into six meaningful dimensions related to freight cost and transport efficiency. Strong factor loadings support the reliability and validity of the results.

RANKING ANALYSIS

S.NO	FACTOR	PERCENTAGE	RANK
1	High transportation, fuel, and operational cost	3.33	1
2	Overdependence on road transport	2.97	2
3	Limited bargaining power with transporters	2.92	3
4	Poor route planning, long travel distance and delivery delays	2.90	4
5	Low shipment volume and lack of load consolidation	2.89	5

INTERPRETATION

The mean rank analysis indicates that high transportation, fuel, and operational costs (3.33) are the most significant challenges. This is followed by overdependence on road transport (2.97) and limited bargaining power with transporters (2.92). Poor route planning, long travel distance, and delivery delays (2.90), along with low shipment volume and lack of load consolidation (2.89), are relatively less critical. Overall, cost-related factors and reliance on road transport are the major concerns affecting transportation efficiency.

(ONE WAY) ANOVA ANALYSIS

1.TRANSPORTATION MODE SELECTION

H_0: There is no significant relationship difference in freight cost optimization among different transportation modes used by SMEs in engineering goods.

H_1: There is a significant relationship difference in freight cost optimization among different transportation modes used by SMEs in engineering goods.

variables		Sum of Squares	df	Mean Square	F	Sig.
Transportation Mode Selection	Between Groups	4.422	2	2.211	.304	.739
	Within Groups	742.568	102	7.280		
	Total	746.990	104			

INTERPRETATION

The ANOVA results (F = 0.304, p = 0.739 > 0.05) show no significant difference in freight cost optimization across transportation modes. Hence, the null hypothesis (H_0) is accepted, indicating that transportation mode selection does not significantly affect freight cost optimization among SMEs.

2.ROUTE PLANNING NETWORK DESIGN

Ho: There is no significant relationship between route planning network design and freight cost optimization among SMEs in engineering goods.

H1: There is a significant relationship between route planning network design and freight cost optimization among SMEs in engineering goods.

variables		Sum of Squares	df	Mean Square	F	Sig.
Route Planning Network Design	Between Groups	**15.921**	**2**	**7.960**	**1.047**	**.355**
	Within Groups	**775.470**	**102**	**7.603**		
	Total	**791.390**	**104**			

INTERPRETATION

The ANOVA results for route planning and network design show no significant relationship with freight cost optimization (F = 1.047, p = 0.355 > 0.05). Therefore, the null hypothesis (H_0) is accepted, indicating that route planning and network design do not significantly affect freight cost optimization among SMEs in engineering goods.

FINDINGS

- Majority of respondents are small enterprises (46.7%) with 5 – 10 years of operations, indicating a growth and developing sector.
- Shipment consolidation, packaging optimization, carrier selection and contract management are the strongest determinants of freight cost efficiency

- High transportation, fuel, and operational costs are the most pressing challenges for SMEs.

SUGGESTIONS

- Combining shipment consolidation, load optimization, packaging improvements, and contract management can maximize cost efficiency
- Negotiating long term contract and evaluating carriers based on cost effectiveness and reliability can strengthen carrier relationships.
- Adopting route optimization tools, real time tracking and data analytics improve shipment efficiency and reduce costs.

CONCLUSION

This study examined freight cost optimization among engineering goods SMEs in Coimbatore. Transportation mode selection and route planning alone do not significantly impact costs, while integrated strategies such as shipment consolidation, packaging optimization, carrier selection, and contract management improve efficiency and performance. High transportation and fuel costs, and reliance on road transport, are major challenges. SMEs adopting structured logistics practices, technology, and multimodal transport achieve better cost control, delivery efficiency, and competitiveness, offering a framework for sustainable freight cost optimization.

REFERENCE

- Suresh, R., & Janarthanan, S. (2024). Optimizing Transportation and Logistics Strategies for Cost Reduction in Export Import Supply Chain Management. *International Journal of Advanced Research in Education and Technology. Available at: https://doi. org/10.15680/IJARETY*.
- Moon, M. C. (2023). Optimization of delivery lead time with freight cost.
- Sæterbø, M., Arnarson, H., & Solvang, W. D. (2023, October). Analysing the Impact of Metal Additive Manufacturing on SMEs Supply Chains Through Localization Optimization. In *International Workshop of Advanced Manufacturing and Automation* (pp. 151-161). Singapore: Springer Nature Singapore.

