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AN ANALYTICAL STUDY ON VEHICLE UTILIZATION FOR MATERIAL PROCUREMENT AT SAKTHI AUTO COMPONENTS LIMITED

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Abstract:

In modern manufacturing, effective logistics and transportation management play a pivotal role in achieving operational efficiency and cost competitiveness. This study examines vehicle utilization within the material procurement system of Sakthi Auto Components Limited (SACL), a leading Indian automotive component manufacturer. The research evaluates the extent to which vehicles are optimally used in inbound logistics and identifies factors leading to underutilization. Using a descriptive research design and data collected from 130 respondents across logistics, procurement, and operations departments, the study employs statistical tools such as chi-square, correlation, and one-sample t-tests to analyze relationships among operational parameters. Findings indicate a significant correlation between employee designation and frequency of dispatch, and a strong relationship between logistics experience and procurement involvement. The study highlights inefficiencies in routing, scheduling, and load management, suggesting improvements through telematics, route optimization, and data-driven decision systems. Enhanced vehicle utilization is found to directly reduce transportation costs, improve supply chain performance, and support sustainable logistics.

Key Words: Vehicle Utilization, Material Procurement, Logistics Optimization, Supply Chain Efficiency, Sakthi Auto Components Limited

Introduction:

The automotive component industry is one of the most complex and logistics-intensive sectors within global manufacturing. Effective material movement is crucial to sustaining production flow, ensuring timely delivery, and minimizing operational costs (Christopher, 2016). Among logistics variables, vehicle utilization the efficient use of transport vehicles has emerged as a key determinant of performance. Poor vehicle deployment results in idle capacity, fuel waste, and delayed deliveries, affecting both cost and production schedules (Chopra & Meindl, 2019).

At Sakthi Auto Components Limited (SACL), efficient vehicle utilization directly influences operational and financial outcomes. Despite a structured logistics system, challenges such as improper scheduling, route duplication, and idle vehicle time persist. This study investigates current utilization practices for vehicles involved in inbound logistics and identifies strategies to optimize them.

The significance of this research lies in its focus on data-driven logistics decision-making, where analytical tools convert operational data into actionable insights (Dekker, Bloemhof, & Mallidis, 2012). In a sustainability context, optimizing vehicle usage also reduces carbon emissions, aligning with India's move toward green logistics and responsible resource management.

Literature Review:

Scholarly studies emphasize that logistics analytics can transform transportation efficiency by integrating data science with fleet operations. Rao and Kumar (2025) explored predictive vehicle utilization using artificial intelligence (AI) models, demonstrating that predictive analytics reduces empty trips and ensures material availability. Similarly, García-Ortiz et al. (2025) highlighted AI-driven maintenance systems that increase vehicle uptime by forecasting breakdowns.

Rao, S., & Kumar, N. (2025): Explored AI and analytics for predictive vehicle utilization in procurement logistics. The study emphasized data-based fleet allocation and resource optimization. It examined hybrid models combining AI and statistical forecasting. Findings concluded that predictive utilization ensures timely material availability.

Garcia-Ortiz, A., et al.(2025): Presented a comprehensive review of AI-driven predictive maintenance and utilization frameworks for vehicle fleets, highlighting challenges in data quality and model deployment at scale. The authors recommended ensemble models for remaining useful life (RUL) estimation and end-to-end cloud frameworks for large fleets. Results showed improved uptime and higher utilization when analytics were integrated with operations.

Silva, M., & Chen, L. (2024): Surveyed AI techniques for sustainable logistics and vehicle routing with environmental constraints. The paper compared machine-learning based travel-time predictors and multi-objective routing that balances utilization, cost and emissions; it concluded AI methods can increase utilization while lowering emissions under proper constraints.

Research Methodology:

Research Design:

The study employs a descriptive research design, focusing on identifying and describing current practices of vehicle utilization in the procurement logistics of SACL. The design allows for observation of relationships between variables such as vehicle scheduling, routing efficiency, and load capacity without manipulation of the environment.

Sample Design:

A total of 130 employees from logistics, procurement, and operations departments were selected using purposive sampling. Respondents were directly involved in vehicle operations, dispatch management, and material movement.

Data Collection:

Primary data were obtained through a structured questionnaire consisting of 22 questions on demographics, operational parameters, and satisfaction levels. Secondary data were collected from SACL's internal logistics records, company publications, and industry reports from ACMA, IBEF, and SIAM (2025).

Statistical Tools:

- Simple Percentage Analysis - to summarize respondent profiles.
- Chi-Square Test - to examine relationships between categorical variables.
- Correlation Analysis - to determine the strength of relationships among continuous variables.
- One-Sample t-Test - to compare observed means against expected operational standards.

These tests provided quantitative evidence for assessing the effectiveness of vehicle utilization and identifying significant operational relationships.

Data Analysis and Discussion:

Descriptive Findings:

The workforce profile revealed that most respondents (58.5%) were between 20-30 years, with 55.4% being female employees. The majority (43.1%) had 1-3 years of experience, indicating a relatively young but operationally active workforce. Procurement officers and supervisors collectively represented over 52% of respondents, suggesting strong participation from frontline logistics roles.

Regarding vehicle deployment, 33.8% of respondents reported using hired third-party vehicles, while another 33.8% indicated a combination of company-owned and outsourced fleets. Only 22.3% relied solely on in-house vehicles. About 46.2% confirmed dispatch frequency of 2-3 times per week, suggesting moderate utilization levels.

While 66.9% rated the current vehicle utilization system as "efficient" or "highly efficient," 37.7% acknowledged occasional delays in vehicle availability, and 36.9% reported vehicles often operated below full load capacity. These findings indicate that while the logistics system performs reasonably well, there is still considerable scope for optimization.

Statistical Analysis:

Chi-Square Results:

The chi-square test revealed a significant relationship between duration in logistics and employee experience ($\chi^2 = 19.578$, $p < 0.05$). Similarly, a significant relationship was found between age and satisfaction with routing processes ($\chi^2 = 26.837$, $p < 0.05$). These results suggest that employee expertise and familiarity with operations influence satisfaction levels and operational performance.

One-Sample t-Test:

A one-sample test compared mean scores for job designation and vehicle dispatch frequency. The results ($t = 30.579$, $p < 0.01$) confirmed that mean differences were statistically significant, with large effect sizes (Cohen's $d = 2.746$). This demonstrates that higher-level employees, such as managers and supervisors, are more actively involved in dispatch supervision and decision-making.

Correlation Analysis:

A strong positive correlation ($r = 0.684$, $p < 0.01$) was observed between employee designation and frequency of dispatch. This indicates that the higher an employee's position, the greater their engagement in logistics coordination. Such a pattern highlights the centralized nature of decision-making at SACL and the influence of organizational hierarchy on logistics activities.

Findings and Managerial Implications:

- Demographic Insights: Most respondents were young and moderately experienced, reflecting a workforce open to adopting new technologies.
- Operational Gaps: Frequent under-loading, scheduling delays, and limited use of automation hinder maximum vehicle utilization.
- Statistical Relationships: Strong correlations exist between employee roles and dispatch management, emphasizing the need for decentralized operational authority.
- Efficiency Rating: Although most respondents viewed the system as efficient, nearly 30% maintained neutral or negative opinions, revealing potential dissatisfaction.
- Significance of Analytics: Analytical tools demonstrated measurable potential for improving logistics decisions, consistent with prior research findings (Sharma & Kaur, 2023).

Managerial Implications:

- Digital Fleet Monitoring: Implement IoT-based telematics to monitor fuel use, idle time, and route deviations in real time.
- Route Optimization Systems: Introduce AI-powered route planning software to minimize empty runs and reduce turnaround time.
- Collaborative Logistics Planning: Encourage better coordination between procurement and logistics departments to ensure synchronized scheduling.

- Driver Training: Conduct workshops on fuel-efficient driving, vehicle loading practices, and preventive maintenance.
- Data-Driven Decision Making: Develop ERP dashboards that integrate procurement, fleet tracking, and performance analytics to enhance decision quality.

Recommendations:

Implementing route optimization, predictive fleet maintenance, and integrated data dashboards will enhance real-time visibility and reduce operational delays. Furthermore, decentralizing decision authority can accelerate dispatch planning and foster accountability across departments.

Conclusion:

This study underscores that vehicle utilization efficiency is a decisive factor in achieving logistics excellence and cost reduction at Sakthi Auto Components Limited. The findings confirm that current operations, while moderately efficient, can be significantly improved through digitalization and analytics adoption.

By embracing Industry 4.0 logistics technologies, SACL can transition from reactive scheduling to predictive logistics management, achieving both economic and environmental sustainability. Efficient vehicle utilization not only strengthens cost competitiveness but also contributes to the company's broader vision of operational excellence and sustainability in the global automotive supply chain.

References:

1. Bansal, M., & Verma, A. (2022). NLP techniques for logistics and procurement data processing. International Journal of Logistics Systems and Management, 23(4), 512-528.
2. Chopra, S., & Meindl, P. (2019). Supply Chain Management: Strategy, Planning, and Operation (7th ed.). Pearson.
3. García-Ortiz, A., et al. (2025). AI-driven predictive maintenance and utilization frameworks for vehicle fleets. Transportation Research Part E: Logistics and Transportation Review, 188, 103562. https://doi.org/10.1016/j.tre.2025.103562
4. Gómez, S., & Alvarez, T. (2021). A quality-driven vehicle routing model for utilization and service optimization. Journal of Transport Management, 47(2), 45-62.
5. Martins, R., et al. (2022). Data analytics in fleet operations: A systematic review. Procedia Computer Science, 200, 354-367.
6. Patel, K., & Joshi, H. (2024). IoT-enabled fleet tracking in automotive logistics. Journal of Intelligent Transportation Systems, 31(1), 88-102.
7. Rao, S., & Kumar, N. (2025). AI and analytics for predictive vehicle utilization in procurement logistics. International Journal of Operations & Supply Chain Management, 14(2), 85-93.
8. Reddy, L., & Iyer, A. (2020). Environmental impact of transport optimization in manufacturing supply chains. Sustainable Production and Consumption, 24(1), 301-309.
9. Rodríguez, P., & Navarro, J. (2023). Fleet behavior analysis through visual analytics for utilization improvement. International Journal of Data-Driven Logistics, 6(3), 211-226.
10. Sharma, V., & Kaur, R. (2023). E-procurement and data-driven transport utilization. Operations and Supply Chain Journal, 12(2), 101-118.
11. Silva, M., & Chen, L. (2024). Machine learning for sustainable vehicle routing with environmental constraints. International Journal of Sustainable Logistics, 15(4), 214-230.
12. Ms. C. Ranganayaki, (2024). Customer satisfaction on inbound and out bound logistics of VL appliances India PVT ltd, Rabindra Bharati University Journal of Economics, Pg. No: 49 - 54.
13. Dr D Mythili, Vishva S & Vishnu Prabhu C (2023), A Study on Effective Logistics Management on Organizational Performance Evidence from Global Logistics, Rabindra Bharati Journal Of Philosophy, 0973 - 0087, Vol. XXXI No.16, PP 94-101
14. Dr. N. Amsaveni, A study on Investigation on Logistics Management towards Malar Brand Rice at Coimbatore, Humanities Aand Social Science Studies, ISSN 2319-829X, Volume 13, Issue 02 No 33,159-162
15. Dr. D Divya, Nithish.P, Sankar M P (2023), A Study on Process Management Based on Supply Chain at Cri Pumps, Shodhsamhita, Volume- VIII, Issue 15, 2022-2023,124-131