

Leveraging Analytics for Operational Efficiency in Logistics Systems

Dr. Harshal Patil

Assistant Professor, Yashaswi's IIMS Chinchwad

Ms. Anjali Rathod

Student, ATSS's Institute of Industrial and Computer Management and Research, Nigdi

ABSTRACT

The increasing scale of e-commerce operations has intensified the need for efficient and data-oriented logistics systems. This study investigates how analytical tools can enhance operational performance in a logistics aggregator environment. The research is based on shipment data collected over a defined period and applies a quantitative approach using spreadsheet-based processing and business intelligence dashboards. Key indicators, including delivery success rate, return-to-origin ratio, transit duration, and shipment cost, were examined to identify inefficiencies. Interactive dashboards were developed to improve monitoring and support decision-making. The results indicate that analytics-driven practices improve operational transparency, reduce dependency on manual reporting, and enable more effective carrier selection. Additionally, structured process documentation contributed to improved workflow consistency. The study highlights the role of analytics as a critical enabler for improving efficiency, reducing costs, and supporting strategic logistics management.

Keywords: Logistics Analytics, Operational Performance, Data Visualization, Supply Chain Analytics, Business Intelligence

INTRODUCTION

The rapid growth of e-commerce has increased the complexity of logistics operations, requiring organizations to handle higher shipment volumes while maintaining efficiency and service quality. Reliance on delayed or intuition-based decision-making often leads to operational inefficiencies and increased costs.

With the advancement of digital technologies, large volumes of logistics data are now available; however, converting this data into actionable insights remains a challenge. Issues such as poor data quality, lack of standardization, and limited analytical capabilities hinder effective decision-making.

Recent developments in analytics and visualization tools have improved operational visibility and process efficiency. This study focuses on leveraging analytical techniques within a logistics aggregator platform to enhance performance. It demonstrates how data-driven approaches, including data preparation, visualization, and performance analysis, can support informed decision-making and improve overall logistics efficiency.

OBJECTIVES OF THE STUDY

- To understand the integration of technology in managing logistics workflows.
- To analyse real-time data for decision-making in shipment and delivery processes.
- To develop a data-driven approach for solving business and logistics challenges.

LITERATURE REVIEW

Albqowr, Alsharairi, and Alsoussi (2024) examined the role of Big Data Analytics (BDA) in supply chain management. The study highlighted that the use of analytics significantly enhances operational efficiency, improves agility, and helps in cost reduction across supply chain processes. However, it also pointed out challenges such as data integration issues and the complexity arising from handling diverse data types. Overall, the study emphasized that while BDA offers strong advantages, organizations must address technical barriers to fully leverage its potential (Albqowr, 2022).

Liu, Cheng, Xia, and Møller (2024) conducted a bibliometric study on supply chain management, focusing on the growing influence of Industry 4.0 technologies. The study revealed a clear shift toward the adoption of artificial intelligence, blockchain, and big data in modern supply chains. It concluded that effective data governance and structured data management are critical for achieving efficiency and improving logistics workflows, highlighting the importance of managing data systematically (Liu, 2024).

Darbanian, Brandtner, and Falatouri (2020) reviewed the application of prescriptive analytics in supply chain management. The paper demonstrated that techniques such as optimization models, genetic algorithms, and RFID-enabled tracking systems are widely used to improve logistics operations. These tools help in optimizing routing, enhancing demand prediction, and reducing delays, thereby contributing to more efficient and responsive supply chain systems (Darbanian, 2020).

Liu, Yeoh, Qu, and Gao (2022) introduced a blockchain-based digital twin model for supply chain management. The study suggested that integrating blockchain with digital twin technology improves transparency and enables real-time data synchronization. This combination helps in reducing fraud, minimizing disputes, and improving overall efficiency in logistics operations, making supply chains more reliable and secure (Liu Y. Y., 2022).

Wang, Zhang, Shi, Duan, and Liu (2018) discussed industrial big data analytics and the challenges associated with handling heterogeneous data environments. The authors emphasized that before deriving meaningful insights, organizations must implement advanced data cleaning and ETL (Extract, Transform, Load) processes. The study highlighted that poor data quality can significantly impact analytics outcomes, making preprocessing a critical step in big data applications (Wang, 2018).

Bach et al. (2022) focused on dashboard design patterns and their importance in data analytics. The study emphasized that dashboards play a key role in simplifying complex datasets and presenting information in a user-friendly manner. It concluded that well-designed dashboards enable decision-makers to quickly understand operational insights and improve communication between analytics teams and management, thereby enhancing decision-making efficiency (Bach, 2022).

Anitha and Malini (2018) reviewed various case studies on the application of data analytics in supply chain management. The authors found that predictive analytics significantly improves demand forecasting and inventory management. However, the effectiveness of these techniques depends largely on the quality and accuracy of input data, highlighting the importance of reliable data sources in achieving successful outcomes (Anitha, 2018).

A systematic review published in Electronic Markets (2016) explored the role of big data in e-commerce. The study showed that data analytics enables organizations to enhance decision-making, better understand consumer behavior, and optimize delivery performance. It also highlighted the increasing use of artificial intelligence in logistics operations, indicating a shift toward more automated and intelligent systems (Chen, 2016).

Jaiswal and Samuel (2023) conducted a bibliometric review of supply chain analytics and observed a rapid increase in research output since 2015. The study identified predictive and prescriptive analytics as the most impactful techniques for reducing operational costs and improving customer service. It emphasized the growing importance of analytics in enhancing supply chain performance and competitiveness (Jaiswal & Samuel, 2023).

Queiroz and Wamba (2019) explored the role of blockchain technology in logistics and supply chain management. The study highlighted that blockchain improves transparency, traceability, and trust within supply chain processes. It also helps in reducing delays caused by disputes and manual verification. However, the authors noted challenges such as scalability issues and difficulties in integrating blockchain with existing legacy systems, which may hinder its widespread adoption (Queiroz, 2019).

METHOD

- **Research Design:** Descriptive and Analytical
- **Sampling:** Non-probability purposive sampling
- **Sample Size:** 150 shipment records
- **Type of Data:** Primary and Secondary
- **Data Collection:** Internal shipment database, operational records, and observations
- **Tools:** Microsoft Excel, Microsoft Power BI

The dataset included shipment-related variables such as delivery status, carrier details, transit time, and shipping cost. The analysis involved data cleaning, KPI calculation, dashboard visualization, and performance evaluation to support data-driven decision-making

RESULTS

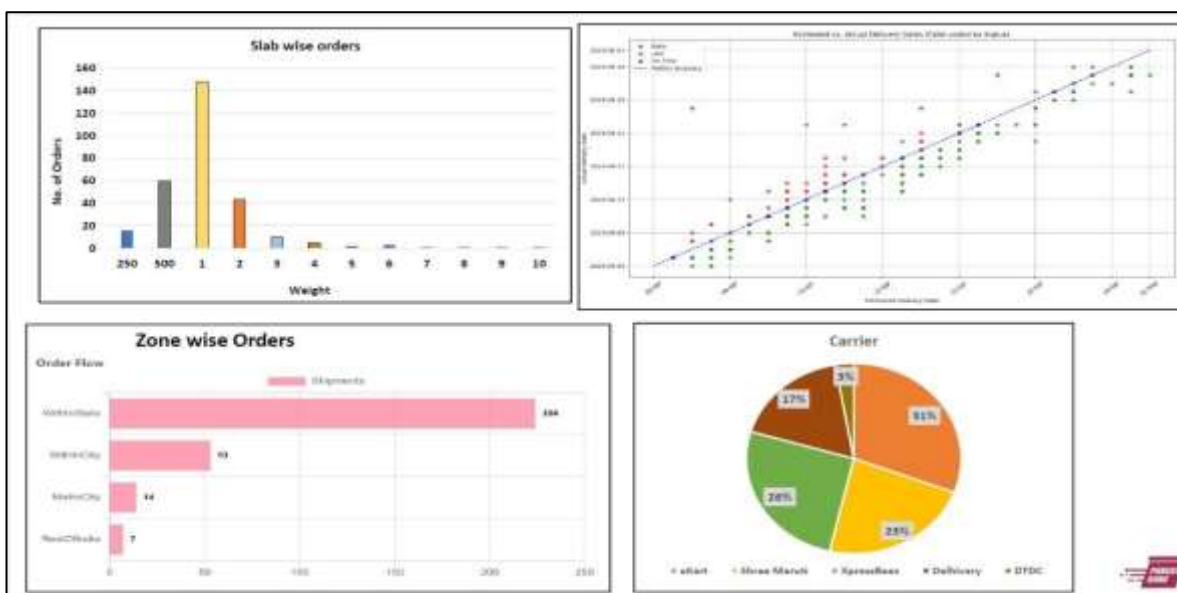
The findings of the study provide valuable insights into logistics performance and operational efficiency.

1. Data Preparation and Reliability: -

The initial dataset contained inconsistencies that affected accuracy. Data cleaning significantly improved reliability, ensuring that performance indicators were based on valid and consistent information

2. Visualization and Decision Support: -

The introduction of interactive dashboards enhanced visibility into logistics operations. These dashboards simplified data interpretation and reduced the time required for report generation, enabling quicker responses to operational issues.

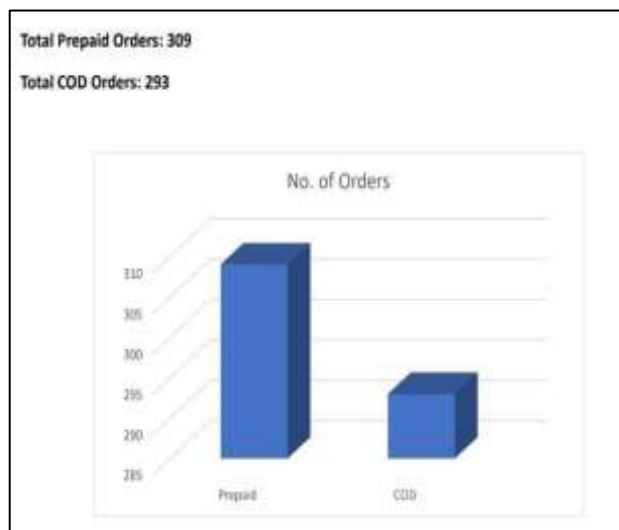


The analysis revealed variations in carrier performance across key metrics. While certain carriers demonstrated faster delivery times, they also exhibited higher return rates. Others showed greater reliability but required longer delivery durations. This highlights the need for balanced decision-making in carrier selection.

Total Orders Manifest	Average Shipping Cost	RTO	Average RTO Charges	RTO Charges recovery
290	92 Rs	12%	47 Rs	2,332 Rs
COD Remittance Paid	Wallet Recharge	Weight Mismatch Recovery	Average COD Charges	LOST
1,16,125 Rs	27,700 Rs	204 Rs	23 Rs	0%
Average GST Charges	COD Remittance Pending			
14 Rs	5240 Rs			

4. Cost Behaviour Analysis: -

The study identified cost variations across different shipment categories. Cash-on-delivery shipments were associated with higher costs compared to prepaid shipments. Additional cost factors, such as discrepancies in shipment weight, were found to impact overall profitability.



5.Process Improvement: -

The development of standardized procedures improved workflow consistency and reduced operational inefficiencies. Process documentation also supported better coordination among team members and facilitated training for new employees.

Client Logistics Performance Report
Executive Summary & Recommendations
Key Achievements: - Overall delivery success rate: 98.30%. - On-time delivery (SLA) rate for non-RTO shipments: 70.20%. - Most utilized courier partner: 'DTDC (Surface)'.
Recommendations: - The Return-to-Origin rate is 0.85%. The 'Non-Delivery Analysis' report provides insights into the primary causes for these returns. - Courier Speed Analysis (Non-RTO): The fastest average last-mile delivery was by 'DTDC (Air)', while the slowest was by 'Delhivery (5Kg)'.

Overall, the integration of analytics contributed to improved operational control, enhanced transparency, and better alignment between data and decision-making processes.

CONCLUSION

The study demonstrates that the application of analytics significantly enhances operational efficiency in logistics systems. Data-driven approaches enable organizations to improve performance monitoring, optimize resource utilization, and reduce operational costs.

The use of visualization tools and structured processes further strengthens the ability to manage logistics operations effectively. The findings suggest that organizations adopting analytics-based strategies are better positioned to respond to dynamic market conditions and increasing customer expectations.

Future research may focus on incorporating advanced analytical techniques such as machine learning and predictive modeling to further enhance logistics optimization and decision-making capabilities.

REFERENCES

- Albqowr, A. A. (2022). Big data analytics in supply chain management: A systematic literature review. *VINE Journal of Information and Knowledge Management Systems*, 657–682.
- Anitha, R. &. (2018). Applications of data analytics in supply chain management: A review of case studies. *International Journal of Supply Chain Management*, 104–110.
- Bach, M. P. (2022). Dashboard design patterns: A review of theory and practice. *Information Systems Frontiers*, 1487–1505.
- Chen, H. C. (2016). Business intelligence and analytics: From big data to big impact. *Electronic Markets*, 89–95.
- Christopher, M. (2016). *Logistics & Supply Chain Management*. UK.
- Darbanian, F. B. (2020). Prescriptive analytics in supply chain management: A review and future research directions. *Annals of Operations Research*, 389–421.
- Jaiswal, A., & Samuel, C. (2023). A literature review-based bibliometric analysis of supply chain analytics. In *Industry 4.0 and Advanced Manufacturing*.
- Udawant, Abhilash & Patil, Harshal. (2025). Integrating Analytics for Machine Losses in Stator & Rotor Production at ABC Corporation. *IBMRD's Journal of Management & Research*. 91-96. 10.17697/ibmrd/2025/v14i2/174491.
- Liu, Y. C. (2024). A bibliometric analysis of supply chain management research with a focus on Industry 4.0 technologies. *International Journal of Production Research*, 4210–4235.
- Patil, Harshal & Kulkarni, Abhay. (2026). VISIONARY LEADERSHIP FOR ANALYTICS EXCELLENCE: A REVIEW OF STRATEGY AND EXECUTION. *IBMRD's Journal of Management & Research*. 15. 12. 10.17697/ibmrd/2026/v15i1/174507.
- Liu, Y. Y. (2022). Blockchain-based digital twin for supply chain management: A systematic literature review. *Computers & Industrial Engineering*, 108246.
- Queiroz, M. M. (2019). Blockchain adoption challenges in supply chain: An empirical investigation of the main drivers in India. *International Journal of Information Management*, 102–119.
- Hasamnis, Sudhir & Patil, Harshal. (2025). Sustainable Supply Chains and Ethical Sourcing ESG Implementation in Procurement, logistics and Vendor Compliance.