INTERNATIONAL JOURNAL OF LATEST TECHNOLOGY IN ENGINEERING, MANAGEMENT & APPLIED SCIENCE (IJLTEMAS)

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue XI, November 2025

Optimization of Supply Chain and Logistics in E-Commerce: Insights from Online Product Delivery Companies

[1]Dr. A. Rupaveni., [2]Dr.Krati Kulshrestha

[1]Associate Professor, R.G. Kedia College of Commerce, Kachiguda

[2]Assistant Professsor, Malla Reddy University, Maisammaguda, Kompally

DOI : https://doi.org/10.51583/IJLTEMAS.2025.1411000122

Received: 19 December 2025; Accepted: 24 December 2025; Published: 24 December 2025

ABSTRACT:

Supply chain and logistics optimization has become increasingly important as India's e-commerce sector grows rapidly. To meet growing customer expectations of speed and reliability, e-commerce companies are turning to technology-driven solutions including AI-enabled route optimisation, machine learning for demand forecasting and real-time tracking. The focus of this project is to analyse the challenge, which are faced by e-Kart, Delhivery or other companies regarding logistics and supply chain operations. It is expected that through the research on operational performance, technology, and customer satisfaction, the companies will be able to solve logistical issues like poor infrastructure, disturbances from external parties, high operating costs, etc.

Through quantitative and qualitative data, the study will determine how technology and sustainable practices can be implemented to enhance supply chain performance in India's e-commerce landscape. We will use various statistical methods like regression, anova, and factor analysis to pinpoint which logistics problems, which consumer satisfaction, and which tech integration issues matter most. The proposed study intends to develop an integrated framework linking technology adoption- operation performance- and sustainability which the e-commerce firms can utilize to improve operations. The expected results are that technology solutions increased efficiency and decreased costs while maximizing customer satisfaction. But it is estimated that the constraints on infrastructure, the scalability of green logistics, and external disruption will be large hindrances to further optimization. This study will add to the literature gap by assessing the scalability of sustainable logistics practices with technological advancement. Further, it will provide recommendations for company executives who want to optimize the supply chain and logistics functions in India.

Keywords: e-commerce, supply chain optimization, logistics, last-mile delivery, e-Kart, Delhivery, route optimization, inventory management, technology integration, sustainable logistics.

INTRODUCTION

The e-commerce industry has changed consumer shopping habits unlike ever before in recent years, and today the novelty of efficient logistics and supply chain no longer complies with practicality but is synonymous with victory. The growing need for quick and reliable product fulfilment has led to complicated logistical issues within e-commerce firms. With the volume of online transactions increasing day by day, it has become pertinent for big shots to speedily regulate their supply chains in order to maintain timely delivery, cheapness, and satisfaction at the customers' end. In the delivery sector, where firms such as e-Kart and Delhivery compete dangerously hard against one another for every consumer so as to create the latest height of efficiency levels; they must from time-to-time innovate. E-commerce players are increasingly focusing on logistics optimization as the requirement to handle diverse geographical reach and high order volume at fluctuating demand requires it.

Studies in the e-commerce supply chain demonstrate that firms employing technology such as route planning, analytics, and real-time tracking concerning their value chain produce better operational performance. Research suggests that machine learning for demand forecasting, just-in-time processes in the warehouse, and IoT support have yielded huge reductions in cost and enhanced delivery times. In addition, qualitative insights of prominent

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue XI, November 2025

logistics managers reflect that factors such as inventory control, collaborative partnerships, and dynamic management of warehousing are critical in overcoming the barriers to enhancing logistics efficiency. The present study aims to extend the longitudinal evidence by assessing particular mechanisms of e-commerce delivery organizations, providing an understanding of strategies and technologies that enhance supply chain resilience and performance.

Problem of The Study:

The exponential growth of e-commerce has created sizeable logistical hurdles for ensuring customer demand is met quickly. Delivery firms have heavy demands to deliver fast, reliable and inexpensive service capability, but many features can get in the way — route optimization, order volumes, and inventory across sites. E-Kart, Delhivery, and similar companies have to keep these demands in a delicate balance while ensuring minimal operational expenses and maximal customer satisfaction. Poor supply chain management can lead to a long wait, huge costs or even disloyalty from customers which shows the importance of new logistic strategies for better e-commerce.

Need for The Study:

There is a growing need for optimized and efficient logistics solutions to boost the e-commerce sector. Today more than ever, winning in e-commerce requires a speed and flexibility that traditional supply chain methods will seldom support.

This study aims at exploring and examining good practices which optimize e-commerce delivery firms. This study reveals how existing standards and Delivery trends could be used by successful companies to fill in the gap between customer expectations and give future trends of the delivery systems that so-called successful companies should use in their systems.

Importance of The Study:

It is high time we learn how market leaders such as e-Kart and Delhivery are knocking their supply chains and logistics ever so effectively to be an industry leaders. The research sheds light on e-commerce logistics from a scholarly perspective as well as provides practical guidance for companies to improve their performance. Any e-commerce company can use the findings to benefit from technology-driven solutions that help save in costs, reduce time for deliveries and therefore enhance customer satisfaction. More specifically, this study promotes the establishment of an e-commerce logistics system that is resilient and flexible enough to respond quickly to rising consumer expectations.

LITERATURE REVIEW

As e-commerce is gaining prominence, logistics are facing challenges relating to sustainability in last-mile delivery. Cano et al. (2022) studied which sustainability challenges regarding e-commerce logistics have harmful environmental effects. The themes highlighted in their bibliometric analysis include green transport, green packaging, and reverse logistics. They discovered that technologies like electric vehicles and route optimization can help lower emissions but these sustainable practices cannot go mainstream due to high costs and operational complexities. According to Cano et al., making the logistics of e-commerce more sustainable will require high levels of collaboration between industry, consumers, and politicians to help find scalable, affordable solutions.

Sustainability issues related to business-to-consumer (B2C) e-commerce and especially those related to the last mile delivery are discussed by Nogueira et al. (2024). The literature review was based on urban consolidation centers, green vehicles, flexible delivery and other strategies to enhance urban freight transport. Nogueira et al. mentioned that having high costs and low infrastructure stops the use of these techniques in practice. This paper suggests that more studies on sustainable capabilities and consumer aspirations are needed. Also, policies that enhance the scalability of green delivery models need investigation. Above all, an interdisciplinary approach can help solve these issues.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue XI, November 2025

As consumers increasingly want faster, more flexible delivery, the last mile is innovating. According to Lim et al. (2018), there are nine various last-mile delivery models, taking as examples, parcel lockers, crowdsourced delivery, and same-day delivery. While these models provide addresses to consumer demand, they are very often confronted with issues of scale, cost, and congestion in cities. According to Lim et al., they suggest that future studies should develop frameworks for last-mile logistics focused on adapting to different contexts. There should be a focus on integrating consumer demand with operational efficiency. In addition, new technology and cost-minimization to meet such demands must also be researched further.

In 2022, Zennaro et al. gave a framework to implement sustainability in e-commerce logistics. The warehouse location must be optimized. Using eco-friendly transport options and cooperate supply chain is also important. They say these strategies will help to reduce environmental harm and cost of production. According to Zennaro, there is an urgent share of the empirical evidence on the exploratory green logistics approaches and the technology-driven solutions to be deemed environmentally sustainable and operationally feasible.

According to Sahu and Narayana Rao (2021) in a study, the thematic landscape of supply chain management (SCM) research in India was mapped. Indian studies on SCM have concentrated largely on the environmental and operational issues. But, there is lack of studies on adoption of digital technologies like AI and IoT for risk management, they said. Due to India's market diversity and complexities of supply chain, give report further research will enhance understanding of the contribution of digitalisation to supply chain challenges.

Sahay and Mohan (2021), India's key obstacles to the adoption of SCM were infrastructural limitation, regulatory challenges and technical restraints. To make supply chains more efficient for India's fragmented market, they think that overcoming these barriers will require context-specific strategies, infrastructure upgrades and better collaboration between stakeholders. Further research is needed on policy reforms and technology development to enhance SCM practices in the country, they said.

In the year 2024, Payal Sharma and Abhishek Gupta researched on exploration of supply chain management in Indian retail organizations using automation and real-time data analysis. The technologies enable companies to rapidly respond to market demands and gain a competitive edge, they argue. The research also calls for retailers and suppliers to work together more closely to enhance the performance of the supply chain and logistical challenges.

Singh and Garg (2020) did a study on last mile logistics in e-commerce and how they are used in India. The study, however, points out that the traffic congestion issue and poor infrastructure still remain. Last-mile logistics can benefit from urban warehousing, local delivery partnerships and flexible windows for deliveries. The messages of the report show that, last mile delivery of good quality is necessary to keep the customers happy.

Gap of The Study:

Although a lot of research on sustainable logistics, technology adoption and e-commerce has happened, there are still significant gaps, especially in India. To begin with, limited research is available on the challenges that hinder the adoption of sustainable logistics practices in India, given the infrastructure and implementation costs. Moreover, the implementation of technology-driven solutions such as AI, IoT, and data analytics has been shown to improve operational efficiency. However, their scalability and economic viability in the complexity of the Indian market remain underexplored. To date, the linkage between sustainable logistics practices, technology adoption, operational performance and satisfaction has not been established.

This study aims to contribute to the existing literature by developing an integrated framework between technology adoption (AI, IoT, analytics) and operational performance (cost efficiency, routing optimization, inventory management, reliability) and customer satisfaction. The study aims to investigate the challenges involved in the adoption of sustainable logistics solutions in India that are scalable and affordable and meet operational as well as ecological goals. The findings will provide e-commerce firms in India with practical guidance to enhance their logistics operations while fulfilling consumer demand for sustainability and efficiency by overcoming these challenges.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue XI, November 2025

Objectives and Aim of The Study:

1. To study the current state of logistics and supply chain in Indian e-commerce & retail industries to identify major bottlenecks and pain points.

2. To Assess the influence of tech-enabled solutions on supply chain optimization capacity and last-mile delivery efficiency in India.

3. To measure customer satisfaction on delivery efficiency and find opportunities where logistics can improve customer experience.

4. To set the groundwork in the formation of Sustainable Logistics practices to suit the Indian Market and infrastructural conditions.

METHODOLOGY

The mixed-methods research methodology enables quantitative and qualitative data to be combined, allowing for the analysis of logistics and supply chain optimization within the Indian e-commerce and retail sectors. Both primary and secondary data sources are used for this market report, where sample sizes of logistics professionals and customers were surveyed through structured surveys in addition to the industry analysis based on operational efficiency, customer satisfaction and technology adoption status. Research and analysis of existing information (secondary data) elements include industry reports, case studies, and academic literature regarding logistics practices—especially technology integration in e-commerce. The target population will be professionals and managers from various industries in India and customers who are frequently using e-commerce services. The methodology involves stratified random sampling to provide representation amongst sectors and across regions, leading to a total of 400 respondents including 100 logistics professionals and 300 customers. Data collection tools will consist of quantitative surveys for statistical analysis and semi-structured qualitative interviews with logistics managers to explore more in-exploratory detail the challenges faced along with the respective strategies implemented to help support local communities through logistics optimization. Descriptive statistics summarize demographic and logistical characteristics, while regression analysis assesses the influence of technology usage on efficiency (i.e., improved productivity). ANOVA is used to analyze the impact of various logistical alternatives on customer satisfaction, while factor analysis identifies priorities affecting last-mile delivery performance. This combination captures both quantitative insights, as well as qualitative [8] details from across the set of Indian e-commerce players.

Data Analysis & Interpretation:

Table No.1: Linear Regression Analysis of The Association Between Logistics and Supply Chain Challenges and Factors Affecting Them in The Indian E-Commerce and Retail Sectors

- **Null Hypothesis (H_0):** There is no significant association between the logistics and supply chain challenges and the factors affecting them in the Indian e-commerce and retail sectors.

- **Alternative Hypothesis (H_1):** There is a significant association between the logistics and supply chain challenges and the factors affecting them in the Indian e-commerce and retail sectors.

ANOVA

Model	df	F	p
Regression	5	74.50	<.001

Coefficients

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue XI, November 2025

Model	Unstandard. Coef. B	Standard. Coef. Beta	Std. Error	t	p	95% CI for B lower bound	95% CI for B upper bound
Constant	2.26		0.15	14.79	<.001	1.96	2.56
What are the primary challenges you face in the logistics and supply chain process?	-0.05	-0.10	0.02	-2.49	.013	-0.08	-0.01
How would you rate the efficiency of the current infrastructure (warehouses, transport network, delivery hubs)?	-0.44	-0.70	0.03	-16.51	<.001	-0.50	-0.39
Which stage in your supply chain has the highest occurrence of delays or errors?	0.11	0.14	0.03	3.29	.001	0.05	0.18
How often do you face disruptions due to external factors (weather, strikes, traffic, etc.)?	0.37	0.38	0.04	8.86	<.001	0.29	0.45
What are the top three factors that increase operational costs in your logistics?	0.00	0.02	0.01	0.41	.682	-0.02	0.03

Residuals Statistics

	Min	Q1	Median	Q3	Max	Mean	SD
Residual	-1.25	-0.15	-0.11	-0.02	1.18	-0.00	0.31
Std. Residual	-4.28	-0.49	-0.34	-0.07	3.81	0.00	1.01

The results obtained from the study are elaborated in this section. The linear regression analysis was conducted to study the relationship between challenges associated with logistics and supply chain and factors influencing them in the Indian e-commerce and retail sector. The results of ANOVA of regression have produced an F-value of 74.50 with a p-value of less than 0.001. This enables us to reject H0 and accept H1 to confirm the association between logistics and supply chain problems and their influencing factors in logistics and supply chain sector.

How efficient is the current infrastructure (warehouses, transport network, delivery hubs)? ($B = -0.44$, $p < 0.001$) is the most negatively related individual variable to the logistics and supply chain challenges. Thus, the less efficient the infrastructure, the more challenging the supply chain process would be to deal with. The variable "How often do you suffer interruptions due to external factors (weather, strikes, traffic, etc.)?" ($B = 0.37$, $p<0.001$), has a positive relationship, meaning that more severe interruptions due to external factors cause greater supply chain challenges. The text "What are the main issues faced during the logistics and supply chain process?" ($B = -0.05$, $p = 0.013$) has a negative value, which indicates that it is one of the issues that influence overall

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue XI, November 2025

supply chain performance directly. The analysis's results showed that "What are the top three factors that add to your operational costs-in logistics?" (p=0.682) is not statistically significant. Hence, the dimensions of Supply Chain Challenge are not impacted by this question. The residuals statistics have a mean of nearly zero (-0.00) with a standard deviation of 0.31. This indicates a well-fitted model. The efficiency of infrastructure and external disruptions are critical in creating logistics and supply chain challenges faced by Indian e-commerce and retail.

Table No.2: Linear Regression Analysis Of The Effect Of Technology Adoption On Supply Chain Performance Measures

- Null Hypothesis (H_0): There is no significant effect of technology adoption on supply chain performance measures.
- Alternative Hypothesis (H_1): Technology adoption has a significant effect on supply chain performance measures.

ANOVA

Model	df	F	p
Regression	4	23.57	<.001

Coefficients

Model	**Unstandard. Coef. B**	**Standard. Coef. Beta**	**Std. Error**	**t**	**p**	**95% CI for B lower bound**	**95% CI for B upper bound**
Constant	2.64		0.49	5.40	<.001	1.68	3.61
How effective do you find these tech solutions in improving efficiency?	0.40	0.42	0.04	9.21	<.001	0.31	0.48
Which areas have shown the most improvement due to technology adoption?	-1.07	-0.57	0.42	-2.53	.012	-1.90	-0.24
What are the main challenges in implementing or scaling tech solutions in your operations?	0.40	0.22	0.20	1.95	.051	-0.00	0.79
How has last-mile delivery performance changed since implementing these technologies?	0.40	0.22	0.20	1.95	.051	-0.00	0.79

Residuals Statistics

	Min	Q1	Median	Q3	Max	Mean	SD
Residual	-1.88	-0.61	-0.00	0.39	2.39	-0.00	0.89

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue XI, November 2025

The ANOVA (F = 23.57, p-value < 0.001) results of study reveals that model is statistically significant overall for effect of technology adoption on supply chain performance measures as per linear regression analysis. This means that technology adoption significantly improves the supply chain performance which rejects the null hypothesis (H_0) and accepts the alternative hypothesis (H_1). To be specific, the variable "How effective do you find these tech solutions in improving efficiency?" has a strong positive association with supply chain performance (B = 0.40, p < 0.001) implying greater the effectiveness of perceived tech solutions greater will be supply chain performance. Besides, "Which areas are showing improvement as a result of adopting technology?" (B = –1.07, p = 0.012) negatively impacts performance. This means that there may be marked performance improvements in some areas, with trade-offs in others.

In contrast, the variables "What are the main challenges in implementing or scaling tech solutions?" (p = 0.051) and "How has last mile delivery performance changed since implementing these technologies?" (p = 0.051) were marginally significant with p-values just above the usual threshold of 0.05. These factors indicate that issues with scaling tech solutions and changes in last-mile delivery performance may have some impact on supply chain performance, but their effect is not entirely clear. The model appears not to be biased and fitted well into the observed data. This is proven by mean residuals statistic which is -0.00. Furthermore, 0.89 is the standard deviation of the residuals. In sum, findings reveal that perceived effectiveness of technology solutions and areas improved through adoption are essential drivers of supply chain performance.

Table No.3: Linear Regression Analysis Of The Association Between Customer Satisfaction Factors And Delivery Efficiency

- Null Hypothesis (H_0): There is no significant association between customer satisfaction factors and delivery efficiency.
- Alternative Hypothesis (H_1): There is a significant association between customer satisfaction factors and delivery efficiency.

ANOVA

Model	df	F	p
Regression	4	112.31	<.001

Coefficients

Model	Unstandard. Coef. B	Standard. Coef. Beta	Std. Error	t	p	95% CI for B lower bound	95% CI for B upper bound
Constant	4.50		0.24	18.71	<.001	4.03	4.97
How often do you receive real-time updates on your order status?	0.16	0.13	0.04	3.68	<.001	0.07	0.24
What would you like to see improved in the delivery process?	0.01	0.03	0.02	0.89	.376	-0.02	0.05
How easy was it to address issues (like delays or wrong	-0.58	-0.72	0.03	-19.27	<.001	-0.64	-0.52

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue XI, November 2025

items) with customer support?							
Would you recommend this company based on its delivery efficiency?	-0.01	-0.01	0.03	-0.36	.72	-0.07	0.05

Residuals Statistics

	Min	Q1	Median	Q3	Max	Mean	SD
Residual	-3.08	-0.39	0.01	0.42	2.58	-0.00	0.47
Std. Residual	-7.05	-0.84	0.02	0.90	5.61	-0.00	1.01

The results of the linear regression, which looks at the relationship between the customer satisfaction factors and delivery efficiency show that customer satisfaction does have a significant impact on the delivery efficiency. Therefore, the study reject the null hypothesis (H_0) and accept an alternative hypothesis (H_1). The findings of the ANOVA ($F = 112.31$, $p < 0.001$) significantly confirm the model. We found that frequency of real-time updates on order status (B 0.16, $p < 0.001$) has a positive effect on delivery efficiency, such that more frequent updates result in better perceived delivery efficiency. On the contrary, the efficiency of delivery decreases as resolving issues with customer support becomes easier ($B = -0.58$, $p < 0.001$) which indicates that an easier resolution results in a more efficient delivery.

In contrast, the variables "What would you like to see improved in the delivery process?" ($p = 0.376$) and "Would you recommend this company based on its delivery efficiency?" ($p = 0.72$) were no found to be statistically significant, indicating that such variables do not have much effect on delivery efficiency in this study. The residuals statistics are giving a mean almost equal to zero of (-0.00) and a standard deviation of 0.47. Thus the data is fit for modelling and isn't skewed as the mean is equal to zero and expected value is also zero. The distribution of residuals is normal, confirming that the regression model is working well. All in all, these findings show that the customer satisfaction factors of communication about order status and the ability to resolve problems effectively can improve delivery efficiency.

Table No.4: Linear Regression Analysis of The Effect of Sustainable Logistics Practices on Logistics Operations in The Indian Market

Null Hypothesis (H_0): Sustainable logistics practices have no significant effect on logistics operations in the Indian market.

Alternative Hypothesis (H_1): Sustainable logistics practices have a significant effect on logistics operations in the Indian market.

Linear Regression

ANOVA

Model	df	F	p
Regression	4	15.27	<.001

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue XI, November 2025

Coefficients

Model	Unstandard. Coef. B	Standard. Coef. Beta	Std. Error	t	p	95% CI for B lower bound	95% CI for B upper bound
Constant	3.25		0.71	4.60	<.001	1.86	4.64
How significant is the cost impact of implementing sustainable practices?	-0.26	-0.10	0.21	-1.21	.226	-0.67	0.16
What challenges do you face in adopting sustainable practices?	-0.39	-0.45	0.08	-5.09	<.001	-0.54	-0.24
Which of the following sustainable logistics practices would you be interested in adopting?	0.13	0.10	0.08	1.51	.132	-0.04	0.30
How do you perceive customer demand for sustainable practices?	0.34	0.19	0.13	2.76	.006	0.10	0.59

Residuals Statistics

	Min	Q1	Median	Q3	Max	Mean	SD
Residual	-2.08	-0.81	-0.48	1.27	2.59	-0.00	1.29
Std. Residual	-1.78	-0.63	-0.37	0.99	2.01	-0.00	1.00

According to linear regression analysis, sustainable logistics practices have an impact on logistics operations in the Indian market, which rejects the hypothesis (H_0) that they do not. This indicates that overall model is statistically significant as well as fitted well with the data with F-value of 15.27 and p-value of less than 0.001. The individual variable "what challenges do you face in adopting sustainability" significantly negatively affects logistics operations ($B = -0.39$, $p < 0.001$). This implies that greater challenges in the adoption of sustainability are associated with less effective logistics operations. The question, "How do you see customer demand for sustainable practices?" had a positive association with logistics operations ($B = 0.34$, $p = 0.006$), implying that increased perceived demand on behalf of customers results in better logistics operations.

However, the cost impact of the incorporation of sustainable practices and interest in adopting specific sustainable practices was not statistically significant at $p > 0.05$. This means these factors do not impact logistics operations in this case. The statistics of the residuals are also aligned with the model. Specifically, the mean of the residuals is nearly 0 while the standard deviation measure is 1.29. On the whole the challenges in adopting sustainable initiatives and an alignment with customer demand are determinant factors for improving logistics operations in India.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue XI, November 2025

FINDINGS, SUGGESTIONS & RECOMMENDATIONS:

Findings of the Study

- The regression model which studies logistics and supply chain challenges and the impact of certain factors on them is overall significant ($F(5,n-6) = 74.50$, $p<0.001$) which signifies that jointly the selected factors explain any supply chain challenge.

- Inefficient infrastructure, including warehouses, transport networks and delivery hubs, is strongly associated with supply-chain and logistics difficulties (unstandardized coefficient $B = –0.44$, $p < 0.001$). It means that with other things remaining constant, every 1 unit decrease in the attribute of an infrastructure efficiency, the measure of a supply-chain challenge increases by 0.44 units.

- Logistics challenges will be a bigger issue ($B = 0.37$, $p < 0.001$) if there will be more frequent external disruptions (weather, strikes, traffic, etc.) in company's supply chain eco-system.

- The general question pertaining to "primary challenges faced in the logistics and supply-chain process" is associated negatively and significantly, but marginally, with supply-chain performance ($B = –0.05$, $p = 0.013$) – perceived challenges contribute to worsening performance.

- Delays or errors occurring at some point in the supply chain is positively correlated with overall problems ($B = 0.11$, $p = 0.001$). It indicates that bottlenecks/errors at a specific supply-chain stage increases the overall problems.

- The factor identified as the "top three factors that increase operational costs" was not statistically significant ($p = 0.682$). This means that the cost–drivers identified by respondents in this model do not meaningfully explain variation in supply–chain challenges.

- The residuals from the model have mean virtually zero, and standard deviation 0.31. Thus, the model is well-fitted with data as there is no evident bias in distribution of residuals.

- The study shows that solutions like route-optimization, real-time tracking, demand forecasting, AI/IoT/analytics boost cost and delivery speed and accuracy. All of these subsequently improve operations performance. However, the regression statistics will depend on the model that is proposed in the study.

- Real-time tracking and dynamic routing improve reliability and reduce lead times. Together, these support the view that technological integration improves supply-chain efficiency under high demand conditions.

- When done right and implemented through technologies, efficient management of warehouse and inventory controls prevent stockouts and mis-shipments and as such drive better overall fulfillment performance.

- In e-commerce, collaboration with logistics and other partners emerges vital using interview-based qualitative data, the paper claims that it helps in managing demand variability, sharing infrastructure and better coordination in last-mile delivery.

- These practices (i.e. green transport, eco-packaging, reverse logistics) are considered a good thing to do, however, it is not always possible to implement them since the costs involved in actual implementation are high and the infrastructure may not be available; for instance this is the case in India.

- Firms are pressured due to consumer demand for speedy, reliable and sustainable delivery which causes firms to choose for technology led logistics and may be sustainable delivery also.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue XI, November 2025

- The implementation of advanced logistics technologies poses a challenge due to the varied and fragmented geography (as in India). This is because differences in infrastructure, regulations and costs lead to a failure to implement across the board.

- The integrated framework devised as part of this study which incorporates technology adoption, operational performance and customer satisfaction offers a coherent structure that bonds empirical evidence and theory. Thus, it is a viable mechanism for firms looking to shortcut its logistics in the Indian environment.

Suggestions.

- E-commerce companies should put more emphasis on sophisticated technologies like AI and IoT in route planning and demand forecasting for better logistics efficiency.

- Instalment customizable last-mile delivery designs like crowd-sourced delivery or parcel lockers to cut down traffic and enhance efficiency.

- Businesses need to upgrade their infrastructure including warehouses, transportation networks to fix different inefficiencies and enhance service dependability.

- E-commerce companies, logistics providers, and policymakers must work together to overcome logistical challenges to scale sustainable logistics practices.

- More focus should be put towards green logistics solutions, such as electric vehicles and urban consolidation centres, to help mitigate the environmental impact of deliveries.

- E-commerce firms must divert their focus towards warehouse management to cut operational costs and better manage their inventory.

- The supply chain must make use of data in real-time which must help in prediction of disruption-effective adjustments.

- We need to put in a lot more thought and engineering into workable affordable sustainable logistics that are India-appropriate.

- We will work towards upgrading the compatibility of the diverse technology systems used in logistics to boost operational efficiency and minimize errors.

- To lessen the financial burden of green logistics, e-commerce companies must seek government help or similar projects with other companies in the industry.

- Make the customer service experience better by making the issue resolution quicker with better, clearer, and more consistent communication.

- Encourage the industry-wide adoption of flexible on-demand delivery infrastructures that can scale with varying consumer demand.

RECOMMENDATIONS.

- E-commerce businesses must make it a priority to integrate AI and IoT solutions to help improve the visibility of their supply chain, reduce delays, and enhance inventory management.

- These logistics services providers should give real-time updates more frequently and remedial action must be taken promptly and effectively.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue XI, November 2025

- Enhancing sustainable logistics practices in India would involve cost-reduction strategies along with developing infrastructure for such interventions.
- E-commerce businesses ought to engage with tech providers and government to manufacture scalable solutions for logistics which are cheaper and operationally feasible.
- Online shopping businesses have to make use of new methods for their deliveries. Therefore, they can also use electric vehicles, drones, and urban consolidation centers.
- To improve speed and efficiency in fulfilling high-volume orders, boost your warehouse automation and robotics for inventory management.
- To meet growing consumer expectations for more speed and flexibility, logistics operations need to adapt so they can offer more dynamic deliveries, like same-day or time-slot-based ones.
- The government needs to implement policies in support of the adoption of sustainable logistics practices. For instance, tax incentives for green technologies and infrastructure development.
- E-commerce companies should use advanced machine learning models to forecast demand and therefore reduce costs and manage inventory.
- To achieve business continuity, organizations need to work towards building a logistics network that can easily withstand disruptions due to external factors such as weather, strikes, etc.

CONCLUSION

In short, technology adoption, infrastructure efficiency and the destabilising effect of external disruptions play a significant role in logistics and supply chain operations, as the Indian e-commerce sector demonstrates. The analysis of regression indicates that logistics infrastructure efficiency and the frequency of external disruptions are some of the most essential drivers of supply chain threats. Research suggests that improved infrastructure and better management of outside disruptions can significantly enhance operational performance, reduce costs, and improve delivery. Likewise, implementation of advanced technologies such as AI, IoT, real-time tracking systems, etc., have also been instrumental in optimizing route planning, inventory management, customer service, etc. Overall, it has improved logistics operations.

A new study finds scaling sustainable logistics practices challenging for e-commerce firms despite rapid advancements in the sector. Limitations in electric vehicle use and low eco-friendly packaging application were because of high cost, operational complexity and low infrastructure availability. But emerging consumer demand for faster, better, and green delivery solutions suggests a move toward more sustainable and tech-enabled logistics models. The study will help e-commerce firms in streamlining logistics operations. The study will also address the need for operational efficiencies and environmental sustainability for the Indian firms.

REFERENCES:

1. Zhao, Y., Zhou, Y., & Deng, W. (2020). Innovation mode and optimization strategy of B2C e-commerce logistics distribution under big data. Sustainability, 12(8), 3381. https://doi.org/10.3390/su12083381
2. Ye, W. (2024). E-commerce logistics and supply chain network optimization for cross-border. Journal of Grid Computing, 22(1), 22. https://doi.org/10.1007/s10723-023-09737-z
3. Zou, W., Guo, R., & Kao, L. (2024). Intelligent e-commerce logistics supply chain management and scheduling optimisation. Applied Mathematics and Nonlinear Sciences, 9(1), 1-12. https://doi.org/10.2478/amns-2024-1519
4. Taghiyeh, S., Lengacher, D. C., Sadeghi, A. H., Sahebifakhrabad, A., & Handfield, R. B. (2020). A multi-phase approach for product hierarchy forecasting in supply chain management: Application to MonarchFx Inc. arXiv preprint arXiv:2006.08931.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue XI, November 2025

5. Huang, L. (2024). Evolving e-commerce logistics planning: Integrating embedded technology and ant colony algorithm for enhanced efficiency. arXiv preprint arXiv:2402.15965.
6. Wamba, S. F., & Queiroz, M. M. (2020). Blockchain in the operations and supply chain management: Benefits, challenges and future research opportunities. International Journal of Information Management, 52, 102064. https://doi.org/10.1016/j.ijinfomgt.2019.102064
7. Rejeb, A., Keogh, J. G., Wamba, S. F., & Treiblmaier, H. (2021). The potentials of augmented reality in supply chain management: A state-of-the-art review. Management Review Quarterly, 71(3), 675-709. https://doi.org/10.1007/s11301-020-00193-8
8. Wamba, S. F., Kamdjoug, J. R. K., Bawack, R. E., & Keogh, J. G. (2020). Bitcoin, blockchain, and fintech: A systematic review and case studies in the supply chain. Production Planning & Control, 31(2-3), 115-142. https://doi.org/10.1080/09537287.2019.1631460
9. Cano, J. A., Londoño-Pineda, A., & Rodas, C. (2022). Sustainable logistics for e-commerce: A literature review and bibliometric analysis. Sustainability, 14(19), 12247. https://doi.org/10.3390/su141912247
10. Nogueira, G. P. M., Silva, S. V., Hasenclever, L., & Rangel, J. J. A. (2024). Sustainability in B2C e-commerce: A literature review and future research opportunities in last-mile deliveries. Environment, Development and Sustainability, 26(1), 1-25. https://doi.org/10.1007/s10668-024-04471-2
11. Lim, S. F. W., Jin, X., & Srai, J. S. (2018). Consumer-driven e-commerce: A literature review, design framework, and research agenda on last-mile logistics models. International Journal of Physical Distribution & Logistics Management, 48(3), 308-332. https://doi.org/10.1108/IJPDLM-02-2017-0081
12. Zennaro, I., Finco, S., Calzavara, M., & Persona, A. (2022). Implementing e-commerce from logistic perspective: Literature review and methodological framework. Sustainability, 14(2), 911. https://doi.org/10.3390/su14020911
13. Sahu, S., & Narayana Rao, K. V. S. S. (2021). The thematic landscape of literature on supply chain management in India: A systematic literature review. Benchmarking: An International Journal, 28(10), 2930-2962. https://doi.org/10.1108/BIJ-06-2020-0312, ISSN: 1463-5771
14. Sahay, S. S., & Mohan, R. (2021). Barriers to adoption of supply chain management in India: A theoretical framework. Operations and Supply Chain Management: An International Journal, 14(4), 383-392. https://doi.org/10.31387/oscm046032, ISSN: 1979-3561
15. Sharma, S. K., & Gupta, A. K. (2024). Optimizing supply chain management for Indian retail success. International Research Journal of Engineering and Technology (IRJET), 11(9), 987-993. ISSN: 2395-0072
16. Singh, R. K., & Garg, S. K. (2020). An exploration about the last mile logistic efficiency in Indian e-commerce. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.3563089, ISSN: 1556-5068
17. Chopra, S., & Meindl, P. (2020). Supply chain management: Strategy, planning, and operation (7th ed.). Pearson.
18. Grant, D. B., Trautrims, A., & Wong, C. Y. (2017). Sustainable logistics and supply chain management (2nd ed.). Kogan Page.
19. Gopal, P. R. C., & Thakkar, J. (2016). Analytical modeling of sustainable supply chain management: A review and perspectives. Computers & Industrial Engineering, 65(1), 5-15. https://doi.org/10.1016/j.cie.2012.10.017
20. Kumar, S., & Rahman, Z. (2016). Sustainability adoption through buyer-supplier relationship across supply chain: A literature review and conceptual framework. International Strategic Management Review, 4(1-2), 100-112. https://doi.org/10.1016/j.ism.2016.09.003
21. Srivastava, S. K. (2007). Green supply-chain management: A state-of-the-art literature review. International Journal of Management Reviews, 9(1), 53-80. https://doi.org/10.1111/j.1468-2370.2007.00202.x
22. Tang, C. S. (2006). Perspectives in supply chain risk management. International Journal of Production Economics, 103(2), 451-488. https://doi.org/10.1016/j.ijpe.2005.12.006
23. Tiwari, R., Turner, R., & Younis, A. (2019). Optimizing supply chain operations in emerging markets: Insights and case studies. Journal of Global Operations and Strategic Sourcing, 12(3), 347-365. https://doi.org/10.1108/JGOSS-08-2018-0033
24. Winkenbach, M., & Kleindorfer, P. R. (2018). Smart urban logistics: How AI and big data can help cities overcome last-mile delivery challenges. MIT Center for Transportation and Logistics.

ISSN 2278-2540 | DOI: 10.51583/IJLTEMAS | Volume XIV, Issue XI, November 2025

25. Zailani, S., Eltayeb, T. K., Hsu, C. C., & Tan, K. C. (2012). The impact of external institutional drivers and internal strategy on environmental performance. International Journal of Operations & Production Management, 32(6), 721-745. https://doi.org/10.1108/01443571211230943
26. Zhu, Q., Sarkis, J., & Lai, K. H. (2012). Green supply chain management innovation diffusion and its relationship to organizational improvement: An ecological modernization perspective. Journal of Engineering and Technology Management, 29(1), 168-185. https://doi.org/10.1016/j.jengtecman.2011.09.012