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Last Mile Delivery Efficiency and Its Impact on Customer Satisfaction in E-Commerce Logistics

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1.ABSTRACT

The rapid expansion of e-commerce has increased the significance of efficient last- mile delivery in ensuring customer satisfaction and business success. Last-mile delivery represents the final stage of the logistics process, where products are transported from distribution centers to customers. This study investigates the impact of last-mile delivery efficiency on customer satisfaction in e-commerce logistics by analyzing key factors such as delivery speed, order accuracy, delivery reliability, tracking transparency, and service flexibility. The paper also examines the operational challenges faced by logistics providers, including high transportation costs, traffic congestion, failed deliveries, and increasing customer expectations.

The study emphasizes the role of advanced technologies such as artificial intelligence, GPS tracking, route optimization, automated delivery systems, and data analytics in enhancing delivery performance and customer experience

2.INTRODUCTION

The rapid growth of e-commerce has transformed the global retail industry by providing customers with convenient access to products and services through online platforms. With increasing internet penetration, smartphone usage, and digital payment systems, customer expectations regarding delivery speed, reliability, and service quality have also increased significantly. In this competitive environment, logistics has become a critical factor influencing the success of e-commerce businesses, particularly the efficiency of last- mile delivery operations.

Last-mile delivery refers to the final stage of the supply chain process in which products are transported from distribution centers or local warehouses to the customer's delivery location. Although it is the shortest segment of the supply chain, it is considered one of the most complex and expensive stages in logistics management. Factors such as urban traffic congestion, rising transportation costs, failed deliveries, inaccurate addresses.

3.MEANING

E-commerce logistics refers to the process of managing the movement, storage, and delivery of products sold through online shopping platforms. It includes all activities involved in transporting goods from sellers or warehouses to customers efficiently and safely.

4.Main Activities in E-Commerce Logistics

4.1.Inventory Management

- Storing and tracking products in warehouses.

4.2.Order Processing

- Receiving and preparing customer orders.

4.3.Packaging

- Packing products securely for delivery.

4.4.Transportation

- Moving goods through trucks, vans, ships, or air transport.

4.5.Last-Mile Delivery

- Delivering products to the customer's doorstep.

4.6.Return Management

- Handling product returns and refunds.

5.FACTOR INFLUENCING IN E-COMMERCE LOGISTICS

- Delivery Speed
- Order Accuracy
- Delivery Reliability
- Real-Time Tracking
- Transportation Cost
- Traffic and Infrastructure
- Technology Adoption
- Flexible Delivery Options
- Customer Communication
- Return and Refund Process
- Warehouse Management
- Delivery Personnel Performance

6.LITERATURE REVIEW

Author	**Year title of study**	**Key finding**
Ranieri,Digiesi & Silvestri	2018 Green Last Mile logistics	The study explained that sustainable delivery practices.
Vakulenko,Hellstrom & Hjort	2018 Customer value in last mile delivery	The research concluded that parcel lockers and flexible delivery options enhance customer convenience.
Lim & winkenbach	2019 Configuring the Last Mile in Bussiness to consumer e-retailing	The study revealed that real time tracking system,delivery transparency and efficient communication positively influence customer trust and satisfaction.

Boysen,Fedtke & schwerdfeger	2021 Last-mile delivery concepts in logistics	The study found that same day and next day delivery services increase customer satisfaction and customer loyalty.

7.THEORITICAL FRAMEWORK

The theoretical framework for this study is based on the relationship between Last Mile Delivery Efficiency and Customer Satisfaction in e-commerce logistics. The framework explains how effective delivery operations influence customer experience, trust, and loyalty in online shopping platforms.

In e-commerce, the last mile delivery process is considered the final and most critical stage of logistics because it directly connects the company with the customer. Efficient delivery services such as fast shipping, accurate order fulfillment, secure product handling, and real-time tracking create a positive customer experience. When customers receive products on time and in good condition, their satisfaction level increases, leading to repeat purchases and brand loyalty.

This framework is supported by the SERVQUAL Theory developed by Parasuraman, Zeithaml, and Berry, which emphasizes service quality dimensions such as reliability, responsiveness, assurance, and empathy. In logistics, these dimensions are reflected through delivery reliability, timely communication, and customer support services.

The framework also incorporates the Logistics Service Quality (LSQ) Model, which explains that delivery accuracy, order condition, information quality, and timeliness are important determinants of customer satisfaction. Efficient logistics performance improves customer perceptions and strengthens competitive advantage in e-commerce businesses.

Technological innovations such as GPS tracking, route optimization systems, artificial intelligence, smart warehouses, and automated delivery solutions further strengthen last mile delivery efficiency. These technologies reduce operational delays, improve delivery accuracy, and provide transparency throughout the delivery process.

Thus, the theoretical framework concludes that improvements in last mile delivery efficiency positively influence customer satisfaction, customer retention, and business performance in e-commerce logistics.

8.NEED FOR THE STUDY

The rapid expansion of e-commerce has significantly increased the importance of efficient last mile delivery systems in logistics management. Last mile delivery represents the final stage of the supply chain, where products are transported from distribution centers to end customers. This stage directly influences customer perception, service quality, and overall satisfaction in online shopping.

With the growing demand for faster and more reliable delivery services, customer expectations have also increased. Consumers now expect same-day delivery, real-time tracking, secure handling of products, and flexible delivery options. Failure to meet these expectations may result in customer dissatisfaction, negative reviews, and reduced customer loyalty. Therefore, improving last mile delivery efficiency has become a strategic priority for e-commerce companies.

Despite advancements in logistics technology, many organizations continue to face challenges such as traffic congestion, high delivery costs, delayed shipments, failed deliveries, and inefficient route planning. These operational issues not only affect logistics performance but also influence customer satisfaction and business competitiveness. Hence, there is a need to examine the relationship between last mile delivery efficiency and customer satisfaction in the context of e-commerce logistics.

This study is important for identifying the key factors that contribute to efficient last mile delivery, including delivery speed, order accuracy, technological integration, communication systems, and service reliability. The research also provides insights into how modern technologies such as GPS tracking, artificial intelligence, route

optimization software, and automated delivery solutions can improve logistics performance and customer experience.

The findings of this study will contribute to the existing literature on e-commerce logistics and provide practical implications for logistics service providers, e-commerce companies, and policymakers. The study will help organizations develop effective delivery strategies, enhance customer satisfaction, improve operational efficiency, and achieve sustainable competitive advantage in the e-commerce industry.

9.OBJECTIVE OF THE STUDY

- To examine the concept and importance of last mile delivery efficiency in e- commerce logistics.
- To analyze the impact of last mile delivery efficiency on customer satisfaction.
- To identify the major factors influencing customer satisfaction in e-commerce delivery services.
- To study the challenges faced in last mile delivery operations in e-commerce logistics.
- To evaluate the role of technology such as GPS tracking, route optimization, and automated systems in improving delivery efficiency.
- To suggest effective strategies for improving last mile delivery performance and enhancing customer satisfaction in e-commerce logistics.

10.HYPOTHESIS OF THE STUDY

10.1.Null Hypothesis (H_0)

There is no significant relationship between last mile delivery efficiency and customer satisfaction in e-commerce logistics.

10.2.Alternative Hypothesis (H_1)

There is a significant relationship between last mile delivery efficiency and customer satisfaction in e-commerce logistics.

10.3.Additional Hypotheses

H_{01}: Delivery speed does not significantly affect customer satisfaction in e-commerce logistics.

H_{11}: Delivery speed significantly affects customer satisfaction in e-commerce logistics.

H_{02}: Real-time tracking and communication do not significantly influence customer satisfaction.

H_{12}: Real-time tracking and communication significantly influence customer satisfaction. H_{03}: Delivery reliability and order accuracy do not significantly impact customer loyalty. H_{13}: Delivery reliability and order accuracy significantly impact customer loyalty.

H_{04}: Technological support in logistics operations does not improve last mile delivery efficiency.

H_{14}: Technological support in logistics operations improves last mile delivery efficiency.

11.RESEARCH METHODOLOGY

11.1.Research Design

The study adopts a descriptive research design to analyze the relationship between last mile delivery efficiency and customer satisfaction in e-commerce logistics. The descriptive approach helps in understanding customer perceptions, delivery performance, and logistics service quality.

11.2.Source of Data

The study is based on both primary data and secondary data.

11.2.1.Primary Data: Primary data is collected from customers who use e-commerce platforms through structured questionnaires and surveys.

11.2.2.Secondary Data: Secondary data is collected from journals, research articles, books, websites, company reports, and published literature related to e-commerce logistics and last mile delivery.

11.3Sampling Method

The study uses a convenience sampling method to collect responses from e-commerce customers who have experience with online shopping and delivery services.

11.4.Sample Size

A sample of 100 respondents is selected for the study to understand customer opinions regarding last mile delivery efficiency and satisfaction.

11.5.Area of the Study

The study focuses on customers using e-commerce platforms in the selected study area/city.

11.6.Tools for Data Collection

A structured questionnaire is used as the main tool for collecting primary data. The questionnaire includes questions related to delivery speed, tracking facilities, order accuracy, delivery reliability, and customer satisfaction.

11.7.Tools for Data Analysis

The collected data is analyzed using statistical tools such as:

- Percentage Analysis
- Mean Analysis
- Correlation Analysis
- Chi-Square Test
- Simple Tabulatio

11.8.Limitations of the Study

The study is limited to a selected number of respondents.

The accuracy of the study depends on the responses provided by customers. Time and resource constraints may affect the scope of the research.

Customer opinions may change over time based on delivery experiences and market conditions.

12.DATA ANALYSIS AND INTERPRETATION

12.1.Age of the respondents

Age Group	Number of Respondents	Percentage
Below 20 years	15	15%
21 – 30 years	45	45%
31 – 40 years	25	25%
Above 40 years	15	15%

Total	**100**	**100%**

Interpretation

The table shows that 45% of the respondents belong to the age group of 21–30 years, indicating that young adults are the major users of e-commerce platforms and online delivery services.

12.2.Customer Opinion on Delivery Speed

Opinion	**Number of Respondents**	**percentage**
Highly Satisfied	30	30%
Satisfied	45	45%
Neutral	15	15%
Dissatisfied	10	10%
Total	**100**	**100%**

Interpretation

The table indicates that 75% of respondents are satisfied with delivery speed, showing that faster delivery services positively influence customer satisfaction in e-commerce logistics.

12.3.Satisfaction with Real – Time Tracking Facility

Response	**Number of Respondents**	**Percentage**
Excellent	35	35%
Good	40	40%
Average	15	15%
Poor	10	10%
Total	**100**	**100%**

Interpretation

The findings reveal that most customers are satisfied with real-time tracking facilities, which improve transparency and customer confidence during the delivery process.

12.4.Problem Faced During Last Mile Delivery

Problems	**Number of respondents**	**Percentage**
Delayed Delivery	40	40%
Damaged Products	20	20%
Lack of Tracking Updates	25	25%

Wrong Product Delivery	15	15%
Total	**100**	**100%**

Interpretation

The table shows that delayed delivery is the major problem faced by customers, affecting customer satisfaction and trust in e-commerce logistics services.

13.FINDING OF THE STUDY

- The study found that the majority of respondents using e-commerce platforms belong to the age group of 21–30 years.
- Most customers are satisfied with the speed of last mile delivery services provided by e-commerce companies.
- Real-time tracking facilities and regular delivery updates significantly improve customer confidence and satisfaction.
- Delayed delivery was identified as the major problem faced by customers during the last mile delivery process.
- Customers prefer e-commerce companies that provide fast, reliable, and accurate delivery services.
- Delivery reliability and proper handling of products positively influence customer loyalty and repeat purchases.

14.SUGGESTION

- E-commerce companies should improve delivery speed to enhance customer satisfaction and maintain customer loyalty.
- Logistics providers should adopt advanced technologies such as GPS tracking, route optimization, and artificial intelligence to improve delivery efficiency.
- Companies should provide accurate real-time tracking information and regular delivery updates to customers.
- Proper packaging and safe handling of products should be ensured to reduce damages during transportation.
- E-commerce firms should strengthen customer support services to quickly resolve delivery-related complaints and issues.

15.CONCLUSION

The study highlights that last mile delivery efficiency has become a critical success factor in the modern e-commerce ecosystem. As online shopping continues to expand rapidly, customer expectations regarding speed, accuracy, transparency, and convenience of delivery services have also increased significantly.

The research identified that efficient last mile logistics, supported by advanced technologies such as GPS-enabled tracking systems, artificial intelligence, route optimization, and automated delivery solutions, positively influence customer satisfaction and purchasing behaviour. Customers are more likely to trust and repeatedly engage with e-commerce platforms that provide timely delivery, accurate order fulfillment, and consistent communication throughout the delivery process.

The study further concludes that ineffective delivery operations, including shipment delays, damaged products,

failed deliveries, and inadequate tracking information, negatively affect customer perception and brand loyalty.

Therefore, e-commerce companies and logistics providers must continuously improve their operational efficiency by adopting innovative delivery strategies, sustainable transportation methods, and customer-centric logistics practices.

Enhancing the quality of last mile delivery services not only strengthens customer satisfaction but also contributes to long-term business sustainability, competitive advantage, and organizational growth in the rapidly evolving digital marketplace.

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