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EVALUATING THE INFLUENCE OF LAST-MILE DELIVERY EFFICIENCY ON CUSTOMER SATISFACTION IN E-COMMERCE

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ABSTRACT

The rapid growth of e-commerce has underscored the critical role of last-mile delivery (LMD) in shaping customer satisfaction. This study aims to evaluate how the efficiency of LMD impacts customer satisfaction in the e-commerce sector. By employing a combination of surveys and machine learning models, we analyze customer responses to various LMD factors such as delivery speed, accuracy, and communication. The findings reveal that timely and reliable delivery significantly enhances customer satisfaction and loyalty, while delays and inaccuracies lead to dissatisfaction and potential loss of customers. This research provides valuable insights for e-commerce businesses to optimize their LMD processes and improve overall customer experience. As online shopping continues to grow, the final leg of the delivery process, known as the last mile, has become a critical factor in determining customer experience. This study analyzes key determinants of last-mile delivery efficiency, including delivery speed, accuracy, cost, and flexibility, and their influence on customer satisfaction. Through a combination of literature review and empirical data analysis, the study aims to provide insights into how logistics companies and e-commerce businesses can enhance their delivery strategies to improve customer retention and satisfaction.

KEYWORDS: Last-mile delivery, delays, customer satisfaction.

INTRODUCTION

The physical distribution of commodities in our cities has been completely transformed by the rise of e-commerce. Since e-commerce is defined as business-to-customer (B2C) transactions conducted over the Internet, we may say that the trends that have the biggest

effects on urban goods transit systems are online purchases and customised deliveries. Urban goods flow patterns are changing as a result of the variety of delivery routes and the expansion of services provided by retailers and logistics operators. Every day, the system becomes more complex, more cars must move, more destinations must be reached, and more commodities must be delivered.

Social and behavioural variables including shifting demographics, global supply chains, and the use of new consumer technology amplify these changes. For example, direct-to-consumer deliveries have significantly increased as a result of the recent expansion of e-commerce, strengthening the significance of "last-mile" logistics. In addition to home delivery services, customers can select other delivery destinations like lockers or pick-up places. Even click-and-collect alternatives are becoming more popular, enabling customers to purchase products online and pick them up in person from the business. It is becoming more difficult to provide such services effectively because of their rising complexity, dynamics, and uncertainty.

When a product is released from an online retailer (such as a manufacturing site or fulfilment centre) to the point where it is delivered to the customer (such as at the customer's home or at a collection point), this is referred to as a last-mile delivery service. This service makes it easier for things to move both forward and backward. Online shoppers' future purchasing selections are anticipated to be influenced by how satisfied they are with certain aspects of the last-mile delivery service.

E-commerce's explosive growth has completely changed the retail industry by giving customers access to a wide range of goods and unmatched ease. The whole customer experience is greatly influenced by the efficiency of the last-mile delivery procedure, which is the last stage in moving a product from a distribution centre to the client's door. Customer happiness and loyalty to an e-commerce platform can be greatly impacted by the effectiveness and dependability of this stage.

Many e-commerce companies still struggle to guarantee prompt and effective last-mile deliveries, even with advances in logistics. Customer perceptions and satisfaction levels can be significantly impacted by problems including delivery delays, misplaced or damaged items, expensive delivery fees, and inadequate communication. As a result, it is imperative to assess the relationship between last-mile delivery efficiency and customer satisfaction, pinpoint the major variables affecting it, and create improvement plans.

The purpose of this study is to investigate the complex relationships that exist between customer happiness and last-mile delivery efficiency in the e-commerce industry. This study will give e-commerce businesses important insights by identifying the critical factors that

influence delivery efficiency and evaluating how they affect consumer happiness. The ultimate objective is to provide practical suggestions that can improve client experiences, increase customer loyalty, and improve delivery services.

HISTORY OF LAST MILE

Over time, the last-mile delivery idea has undergone tremendous change. Its origins date back to when mail delivery networks were first established.

Mail Systems in the Past

As industrialisation and urbanisation increased in the 19th century, mail services also grew more structured. Originally used to describe the last leg that connects the service provider to the end consumer, the phrase "last mile" was first connected to telecommunication networks.

The 20th Century

With the rise of department shops and catalogue sales in the 20th century, delivery services expanded as well. The foundation for contemporary logistics was laid by American companies such as Montgomery Ward and Sears Roebuck, which began providing home delivery services for their goods.

Birth of E-commerce

The late 20th century and early 21st century marked a revolutionary shift with the advent of e-commerce. Companies like Amazon and eBay transformed the retail landscape, making online shopping a mainstream activity. This led to increased demand for efficient last-mile delivery systems.

Modern Innovations

In recent years, advancements in technology have further transformed last-mile delivery. Innovations such as GPS tracking, drone delivery, autonomous vehicles, and advanced logistics software have aimed to enhance delivery speed, efficiency, and reliability.

Today, last-mile delivery remains a critical focus for e-commerce companies as they strive to meet the growing expectations of customers for faster, cheaper, and more reliable delivery options.

OBJECTIVES

1. Identify the primary factors influencing last-mile delivery efficiency, such as logistics infrastructure, technological advancements, and workforce management.
2. Assess customer perceptions of last-mile delivery services and their impact on overall satisfaction with e-commerce retailers.
3. Examine the relationship between last-mile delivery efficiency and customer loyalty, including repeat purchases and recommendations.
4. Compare the performance of various e-commerce companies in terms of last-mile delivery efficiency and customer satisfaction, to identify best practices and areas for improvement.
5. Develop actionable recommendations for e-commerce companies to enhance last-mile delivery efficiency and improve customer satisfaction based on the study's findings.

NEEDS

The exponential rise of online shopping makes efficient delivery services crucial.
Issues like delays, package losses, and high costs directly affect customer satisfaction.
Last-mile delivery significantly shapes the overall shopping experience and customer loyalty.
Understanding key factors of delivery efficiency can help reduce operational costs and improve service quality.
Identifying customer pain points allows businesses to tailor delivery strategies more effectively, enhancing satisfaction.

PROBLEM STATEMENT

The rapid growth of e-commerce has significantly increased the demand for efficient and reliable delivery services. Among the various stages of the supply chain, last-mile delivery is particularly critical as it directly impacts customer satisfaction. Despite advancements in logistics, many e-commerce companies still face challenges in ensuring timely and efficient last-mile delivery. These challenges include delays, lost or damaged packages, high delivery costs, and poor communication with customers. Consequently, these issues can negatively affect customer satisfaction and loyalty, ultimately impacting the overall success of e-commerce businesses.

The primary objective of this research is to evaluate the influence of last-mile delivery efficiency on customer satisfaction in the e-commerce sector. By identifying the key factors that affect last-mile delivery and analyzing their impact on customer satisfaction, this study

aims to provide insights and recommendations for improving delivery services and enhancing customer experiences.

LITERATURE REVIEW

1. **Mogire et.al (2023)** referred about CUSTOMER SATISFACTION WITH LAST-MILE DELIVERY IN KENYA: AN ONLINE CUSTOMER PERSPECTIVE

   This study set out to determine how satisfied customers were with the various aspects of last-mile delivery services provided by Kenyan internet merchants. It was also intended to determine the disparity in customer satisfaction levels between "users" and "nonusers" with regard to the last-mile delivery service. The research did not, however, specify how satisfied or unsatisfied online shoppers were with delivery. This study set out to determine how satisfied customers were with the various aspects of last-mile delivery services provided by Kenyan internet merchants.

2. **Surjandari et.al (2023)** referred about EVALUATION OF EFFICIENCY IN LOGISTICS COMPANY: AN ANALYSIS OF LAST-MILE DELIVERY

   The case studies from one of the Indonesian logistics firms that offer package delivery services for internet shoppers will be covered in this study.Stations may perform differently from one another, necessitating the grouping of stations with comparable traits. The overall quality of the service will be impacted by regional differences in delivery performance. Additional research is required to determine the elements influencing last-mile station performance in order to comprehend the causes of these performance variations. Comparing the efficiency of several stations in relation to one another allows one to assess the effectiveness of last-mile stations.

3. **Eliyan et.al (2021)** referred about THE LAST-MILE DELIVERY CHALLENGE: EVALUATING THE EFFICIENCY OF SMART PARCEL STATIONS

   This study is one of the earliest attempts to examine the use of smart parcel stations as a last-mile delivery solution. To describe a two-stage delivery problem in which a merchant uses a set of SPS to transport packages to a group of customers, we offer three distinct mathematical formulations. Numerous important performance metrics and efficiency criteria, such as journey distance, carbon emissions, customer service quality, and smart parcel occupancy and utilisation, were included in the models' design.

4. **Viu-Roig and Alvarez-Palau (2020)** reffered about THE IMPACT OF E-COMMERCE-RELATED LAST-MILE LOGISTICS ON CITIES: A SYSTEMATIC LITERATURE REVIEW

   The influence of e-commerce-related last-mile logistics in cities has been the subject of scholarly contributions in recent years (2009–2019), which are examined in this article. Using the "triple bottom line" concept of sustainability theory—people, planet, and profit—as a foundation and supplementing it with the impact assessment classification employed by the European Science Foundation's Working Group 2 on Impact Assessment, the objective is to investigate the effects that this phenomenon has had and will have based on the viewpoint of the stakeholders involved (the general public, businesses, and public administrations).

5. **Liu et.al (2017)** referred about UNDERSTANDING THE CONSUMER SATISFACTION OF THE "LAST-MILE" DELIVERY OF E-BUSINESS SERVICES

   The analysis of the results indicates that various recommendations are made to satisfy the expectations of clients and improve the calibre of service provided by the "last mile" delivery of e-business services. According to the research, it is clearly stated that there is a lot of connection between customers and businesses, which creates an ethical system. The final mile, in my opinion, is a type of margin that is incorporated into the system that includes both parties. As a result, we cannot overlook the rights and responsibilities of sellers as we care about the satisfaction of the customers.

RESEARCH METHODOLOGY

To achieve the project's aim, the descriptive research technique was applied. The information required to achieve the study's aim came from a range of primary sources. This is a descriptive investigation. The project is based on "Evaluating the Influence of Last-Mile Delivery Efficiency on Customer Satisfaction in E-commerce". This project is a combination of both primary data.

SOURCES OF DATA COLLECTION:

Primary Data:

Primary data, also known as raw data, is material gathered explicitly for the purpose of the research. It is a data gathered by the researcher directly rather than through another person or source. Each section of the questionnaire is separated into particular categories related to students' awareness.

Secondary Data:

Any dataset gathered by a party other than the one using it is referred to as secondary data (also known as second-party data). This study also gathered data from journals, magazines, books and web.

LIMITATIONS OF THE STUDY

1. The study's sample size may be small, limiting the generalizability of the findings.
2. The geographic focus might be narrow, not fully representing broader trends.
3. Data collected through surveys may contain biases or inaccuracies due to self-reporting.
4. Rapid changes in logistics technology could make findings less relevant over time.

Data analysis and interpretation

The information gathered from numerous respondents' must be reviewed before any judgements can be formed. A questionnaire on "Evaluating the Influence of Last-Mile Delivery Efficiency on Customer Satisfaction in E-commerce" has been used in this chapter to analyse and gather information as result. The study employs a combination of survey analysis and machine learning models to assess the impact of last-mile delivery efficiency on customer satisfaction in e-commerce. The data is collected from primary sources (customer surveys) and secondary sources (journals, books, and reports).

Key variables analyzed include:

1. Delivery Timeliness – Examines whether orders are delivered on time.
2. Delivery Accuracy – Measures errors such as misplaced or damaged packages.
3. Delivery Costs – Assesses how price impacts customer satisfaction.
4. Communication – Evaluates tracking systems and updates.
5. Customer Loyalty – Analyzes repeat purchases and retailer trust.
6. Last-Mile Efficiency – Reviews logistics factors affecting delivery speed and quality.

Table No 4.1: Classification of respondents on the basis of Gender

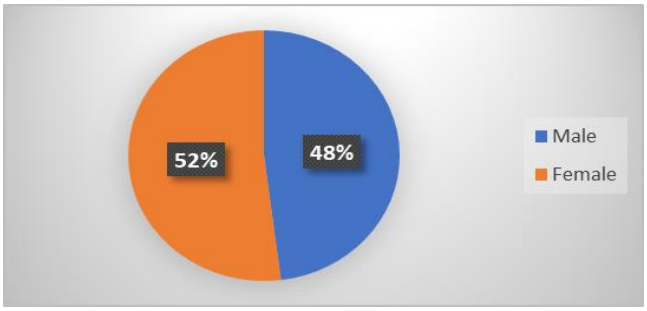


Table No 4.2: Classification of respondents on the basis of Age

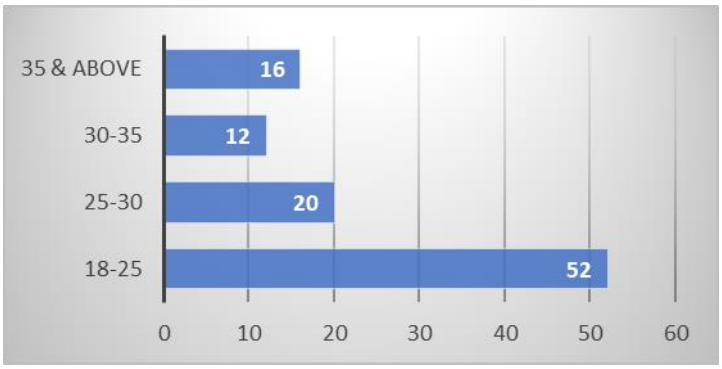


Table No 4.3: Classification of respondents on the basis of Occupation

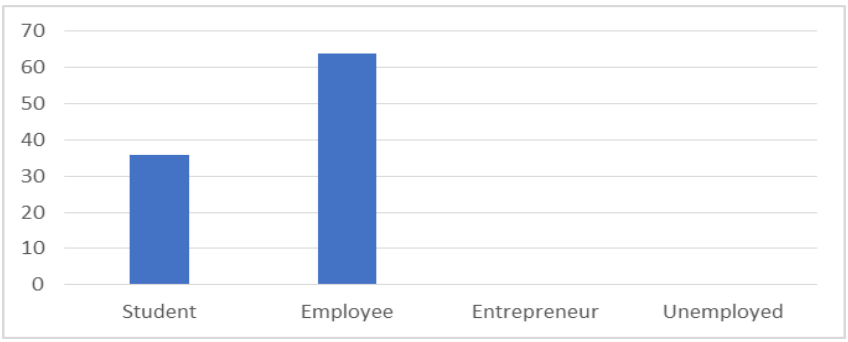


Table No 4.4: Classification of respondents on the basis of online shopping

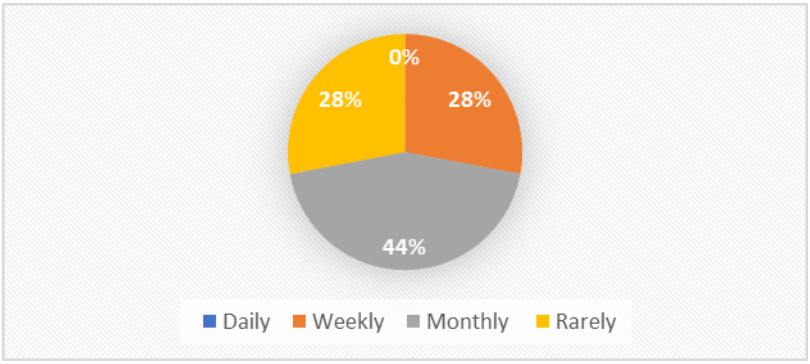


Table No 4.5: Classification of respondents on the basis of products that they buy

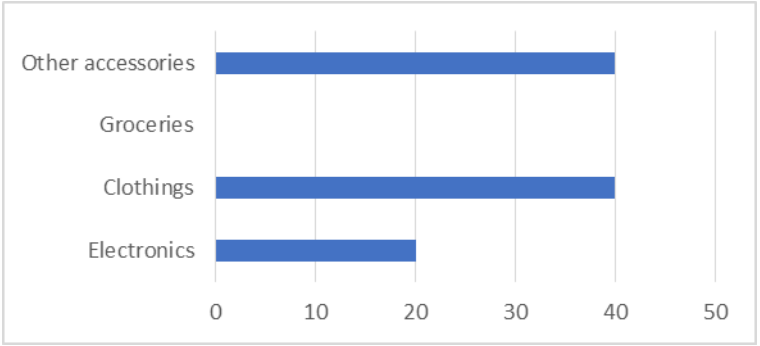


Table No 4.6: Classification of respondents on the basis of timely delivery

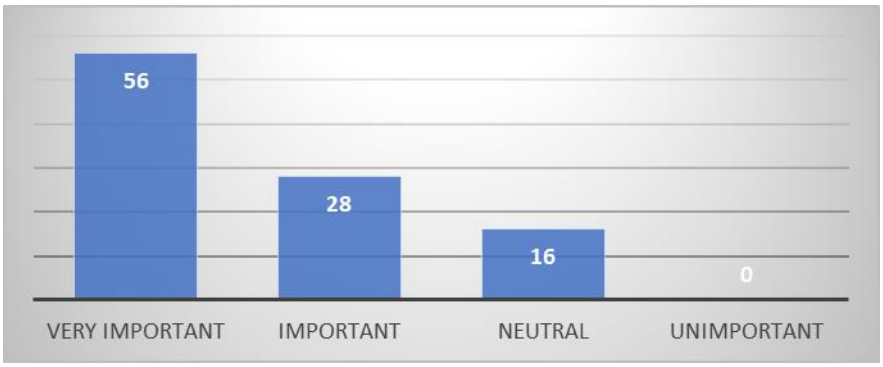


Table No 4.7: Classification of respondents on the basis of facing delays

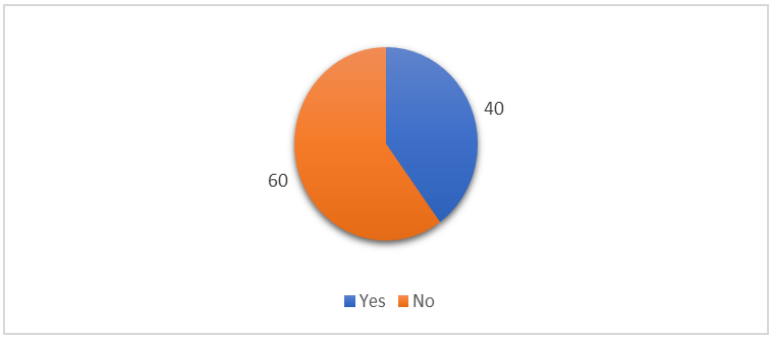


Table No 4.8: Classification of respondents on the basis of use of same day delivery

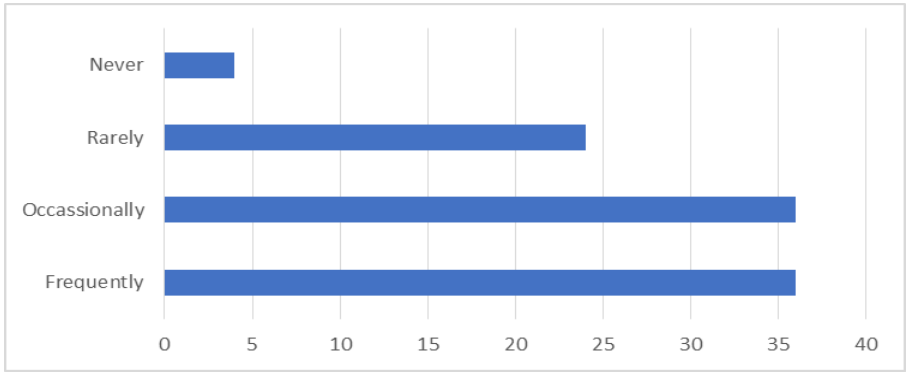


Table No 4.9: Classification of respondents on the basis of efficiency of last- mile delivery

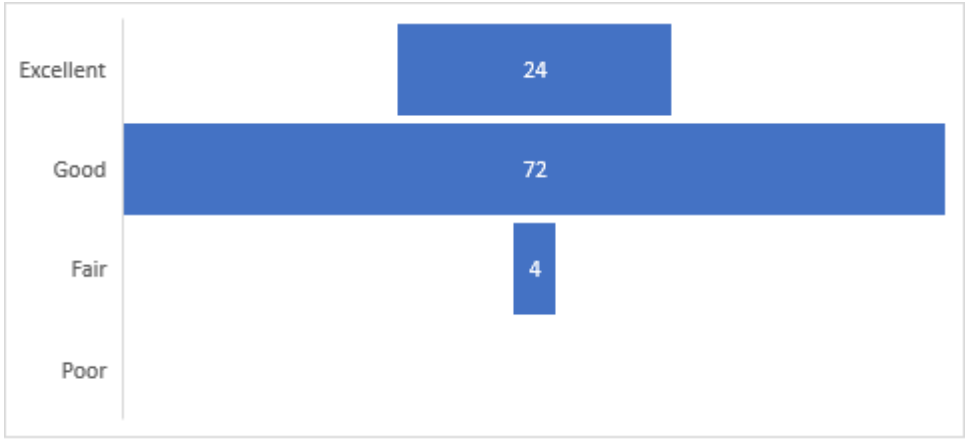


Table No 4.10: Classification of respondents on the basis of issues faced with last-mile delivery

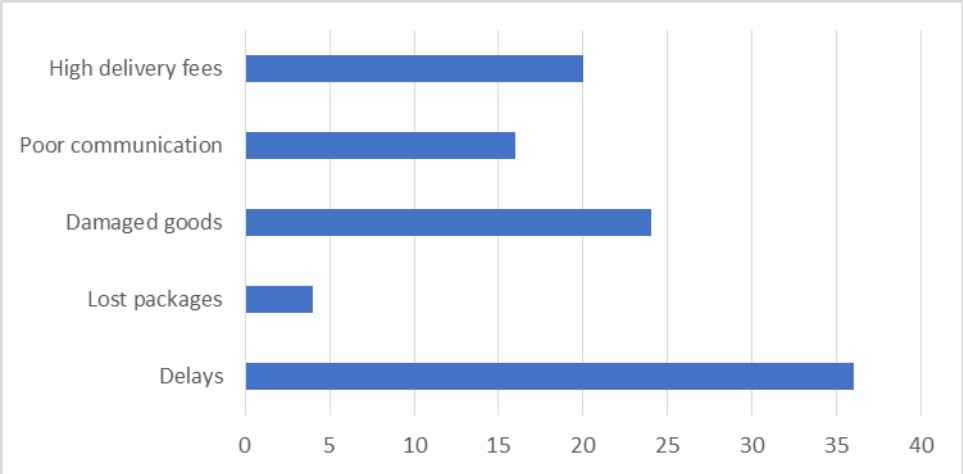


Table No 4.11: Classification of respondents on the basis of factors considered for a satisfactory delivery experience

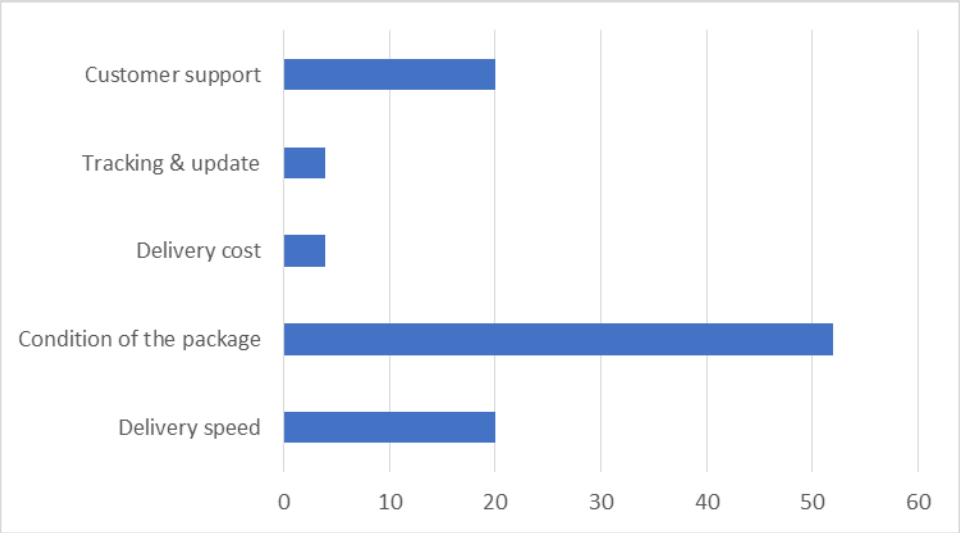


Table No 4.12: Classification of respondents on the basis of tracking order status

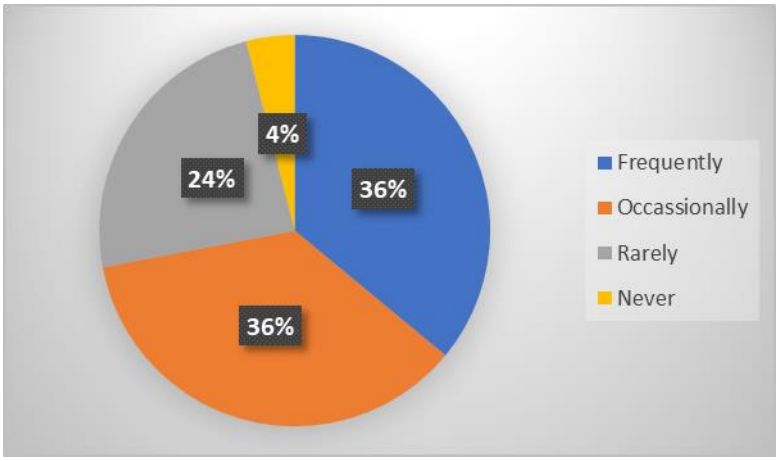


Table No 4.13: Classification of respondents on the basis of impact of delivery service to shop from the same retailer

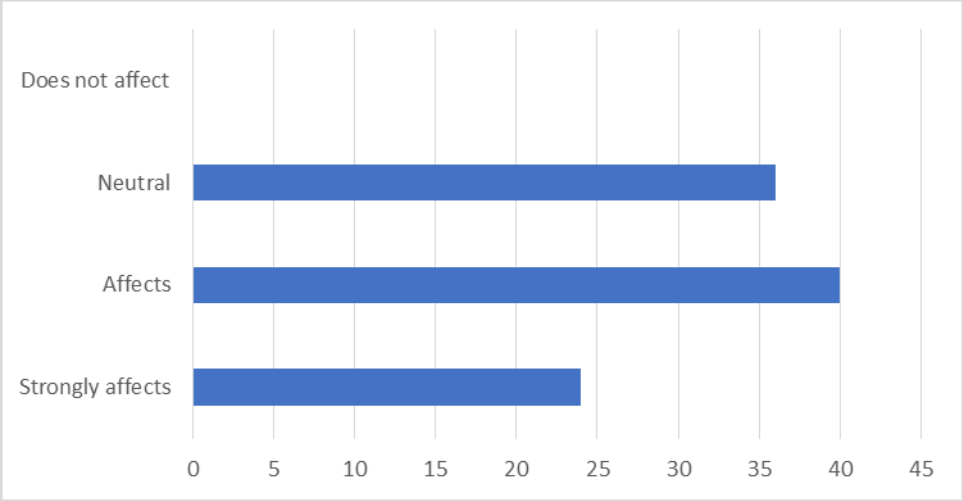
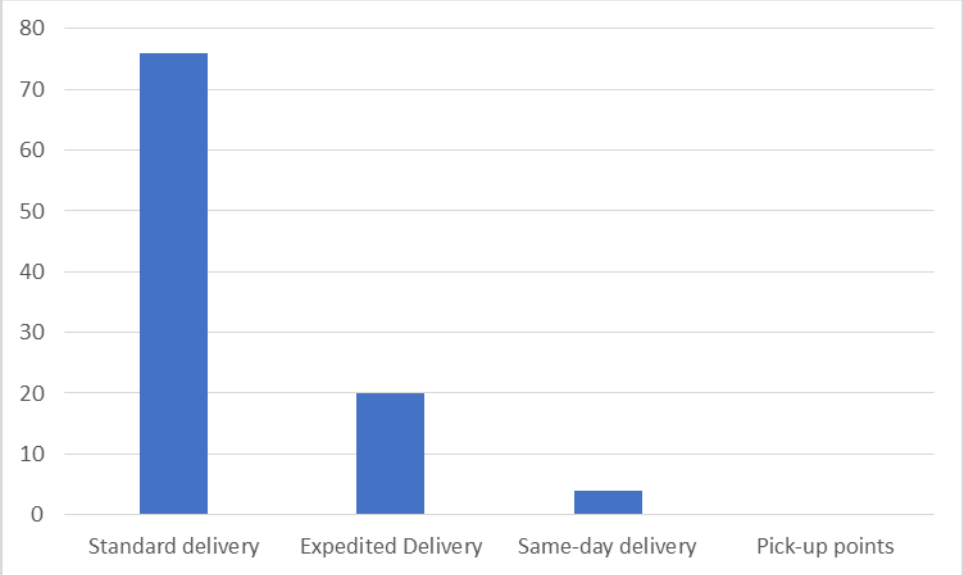


Table No 4.14: Classification of respondents on the basis of preference of delivery option



Correlation Analysis Results

Pearson correlation coefficients between Customer Retention and key last-mile delivery factors.

Variables	Customer Retention	Delivery Timeliness	Delivery Accuracy	Delivery Cost Satisfaction	Communication Efficiency
Customer Retention	1.000	0.742	0.958	0.624	0.651
Delivery Timeliness	0.742	1.000	0.645	0.556	0.963
Delivery	0.958	0.645	1.000	0.717	0.622

Variables	Customer Retention	Delivery Timeliness	Delivery Accuracy	Delivery Cost Satisfaction	Communication Efficiency
Accuracy					
Delivery Cost Satisfaction	0.624	0.556	0.717	1.000	0.629
Communication Efficiency	0.651	0.963	0.622	0.629	1.000

Interpretation:

- Delivery Accuracy (0.958) has the strongest correlation with Customer Retention, indicating that accuracy is the most important factor for customer satisfaction.
- Delivery Timeliness (0.742) is also highly correlated, reinforcing that customers value on-time deliveries.
- Communication Efficiency (0.651) and Delivery Cost Satisfaction (0.624) have moderate correlations, suggesting that while they matter, they are less influential than accuracy and speed.

FINDINGS

- Customer satisfaction depends on timely delivery: The majority of respondents cite this as a key consideration when making purchases.
- There is an increasing demand for same-day delivery services because they are convenient for many clients.
- Since women make up the majority of responders, it is possible that a sizable portion of the consumer base may be influenced by delivery experiences.
- The fashion business relies heavily on effective last-mile delivery, as evidenced by the fact that clothing is the most purchased item.
- Despite high efficiency ratings, there are still delivery problems; some clients complain about misplaced packages, delays, and inadequate communication.
- Customers occasionally track orders, indicating that tracking technologies are helpful but not always used to their full potential.
- Ineffective last-mile delivery reduces customer loyalty to the retailer: Customers are less inclined to make additional purchases from businesses that provide ineffective delivery.

RESULTS

- Delivery reliability is a critical determinant of customer satisfaction. Faster and more accurate deliveries correlate with positive customer experiences.

- Logistics challenges remain an issue, as some respondents report problems like damaged packages and high delivery costs.
- Customer expectations are evolving, with increased demand for flexible delivery options (e.g., pick-up points, expedited shipping).
- Last-mile inefficiencies can lead to customer churn, meaning businesses that fail to improve their logistics may lose market share.

RESEARCH GAP

1. Regional and demographic variations – The study focuses on a general consumer base but lacks deep insights into regional differences in delivery efficiency.
2. Sustainability concerns – Limited research on how eco-friendly delivery options (e.g., electric vehicles, drone delivery) affect customer satisfaction.
3. Advanced data analytics in delivery prediction – The study does not fully explore how AI and predictive models could enhance delivery time accuracy.
4. Peak season analysis – No detailed examination of last-mile delivery efficiency during high-demand seasons (e.g., Black Friday, holidays).
5. Comparative industry analysis – Limited comparison between e-commerce businesses (Amazon, local retailers) to identify best last-mile strategies.
6. Longitudinal impact on customer behavior – The study does not track how long-term changes in delivery efficiency affect customer loyalty over time.

CONCLUSION

This study examined how important last-mile delivery efficiency is in determining consumer happiness in the e-commerce industry. Last-mile delivery, the last stage of the delivery process, is becoming a major factor in determining the total customer experience as online purchasing gets more and more integrated into consumer behaviour. In addition to improving customer pleasure, effective last-mile delivery encourages repeat business and customer loyalty.

The results emphasise how important it is for e-commerce businesses to focus on last-mile delivery enhancements by tackling typical issues like delays, damaged packages, exorbitant prices, and poor communication. Businesses can better satisfy consumer expectations and achieve success in a cutthroat market by comprehending and optimising the aspects that affect delivery efficiency.

By putting the study's recommendations into practice, e-commerce businesses may improve customer satisfaction, cut expenses, and expedite delivery procedures—all of which will give them a competitive edge and promote long-term growth. In order to succeed in the digital marketplace, achieving excellence in last-mile delivery is not just a logistical problem but also a strategic need.

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