An Analysis on Enhancing Last Mile Delivery Efficiency in the Field of E-Commerce Logistics at Gati Allcargo In Madnayakanahalli Bangalore

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ABSTRACT:

The rapid growth of e-commerce has led to an increased demand for efficient logistics systems, with particular emphasis on enhancing last-mile delivery (LMD) efficiency. Last-mile delivery is the final leg of the supply chain, where goods are delivered from a distribution center to the end consumer. This phase is crucial in ensuring timely deliveries, cost-effectiveness, and overall customer satisfaction. Gati All Cargo, a leading logistics player in India, operates in a highly competitive market, especially in urban areas like Madnayakanahalli, Bangalore. This study investigates the challenges faced by Gati All Cargo in last-mile delivery and explores potential strategies to enhance delivery efficiency.
The Analysis that I have used in the report is Chi square statistics test where by using the Primary data of the project like current efficiency of last mile delivery at the branch where its Efficient, very Efficient neutral in efficient and we have found that it rejects the Chi Square Statistics. challenges faced in last mile delivery for this also the same I have done Chi Square Statistics and it Rejects.

Keywords: Last-mile delivery, e-commerce logistics, efficiency, route optimization.

1) INTRODUCTION:

Over the past ten years, the e-commerce sector has experienced exponential growth, revolutionizing how businesses and consumers conduct business and shop. Last-mile delivery, the last phase of delivery where items are moved from a distribution center to the final consumer, is an essential component of e-commerce logistics. Because it directly affects customer happiness, operating expenses, and the supply chain's overall efficiency, this phase is frequently regarded as the most crucial and difficult.

Urban congestion, shifting client demands, logistical challenges, and the growing demand for quicker deliveries are some of the causes of last-mile delivery inefficiencies. Customers are expecting same-day or next-day delivery services, so businesses are under increasing pressure to streamline their processes without sacrificing quality or driving up expenses. This makes last-mile In the logistics industry, delivery serves as a hub for innovation and process enhancement.

The activities of Gati All cargo at its Madnayakanahalli office in Bangalore, a location marked by rapid urbanization and a strong demand for e-commerce services, are the subject of this study. The study intends to investigate contemporary last-mile delivery issues and pinpoint workable answers to improve operational effectiveness. This study aims to provide useful insights that can assist Gati All cargo in enhancing the quality of its services while preserving cost-effectiveness by examining current procedures and utilizing cutting-edge technologies.

RESEARCH METHODOLOGY:

The factors influencing last-mile delivery efficiency in the e-commerce logistics operations at Gati All cargo in Bangalore, are examined in this study using a methodical methodology. To provide a thorough examination, the methodology combines qualitative and quantitative research techniques. To examine current last-mile delivery procedures, find inefficiencies, and suggest workable fixes, a descriptive study design was selected. This architecture makes it easier to thoroughly examine stakeholder viewpoints and operational procedures.

Primary Data is Key stakeholders, such as delivery staff, logistics managers, and customers, participated in structured interviews and questionnaires to gather data. The purpose of the survey was to learn more about operational bottlenecks, satisfaction levels, and delivery issues. Secondary Data is to gain an understanding, company documents, industry reports, delivery performance measures, and scholarly literature were examined.

3.1) REVIEW OF LITERATURE:

Smith and Rogers (2023):

Smith and Rogers (2023) investigate the adoption of autonomous delivery vehicles (ADVs) in last-mile logistics. The paper highlights the potential of ADVs to significantly reduce labor costs and improve delivery times in dense urban environments. The authors explore challenges such as regulatory barriers, technical limitations, and infrastructure readiness, while discussing pilot programs in cities like San Francisco and Shanghai.

Hernandez and Lee (2022):

Hernandez and Lee (2022) analyze the use of multi-modal delivery strategies to address inefficiencies in last-mile logistics. Their study emphasizes combining different delivery methods (e.g., trucks, bicycles, drones) to improve flexibility and reduce delivery times. In congested urban areas, using bicycles and drones for shorter distances and trucks for longer routes has been shown to reduce costs and minimize environmental impact.

Aslam, Mahmood, and Asim (2021):

In the article "Green Logistics: A Study on Sustainability in the Logistics Sector" by Aslam, Mahmood, and Asim (2021), the authors explore the concept of green logistics and its critical role in promoting sustainability within the logistics sector. The study emphasizes the growing environmental concerns associated with traditional logistics practices, which contribute significantly to carbon emissions and resource depletion.

Beheshti and Haghani (2020)

In the article "The Impact of Infrastructure on Last-Mile Delivery Efficiency: A Comparative Study" by Beheshti and Haghani (2020), the authors examine how infrastructure quality influences the efficiency of last-mile delivery operations in logistics. The study recognizes that last-mile delivery is a crucial component of the supply chain, significantly affecting overall logistics performance and customer satisfaction.

Bashiri, Rahimi, and Sadeghi (2019)

In the article "Seasonal Demand Management in Last-Mile Delivery" by Bashiri, Rahimi, and Sadeghi (2019), the authors investigate the impact of seasonal demand fluctuations on last-mile delivery operations within the logistics sector.

2) DATAANALYSIS:

4.1Table about the current efficiency of last mile delivery at the branch

Particulars	No of respondents	No of Percentage
Very Efficient	29	28.6%
Efficient	41	40.6%
Neutral	26	25.7%
In Efficient	5	5%

Table 4.1

Hypothesis Formulation

1. **Null Hypothesis (Ho):**

The observed distribution of satisfaction levels is Consistent with an expected Distribution (e.g., equal distribution across categories)

2. **Alternative Frequency (H1):**

The observed distribution of Satisfaction levels Significantly differs from the Expected Distribution.

Expected Frequency Calculation:

First, we calculate the expected frequency for each category. To do this, we need the total number of respondents:
Oi is the observed frequency (actual data)
Ei is the expected frequency (calculated based on the proportions, if the distribution were uniform)
Total respondents=29+41+26+5=101

Expected frequencies:

Very Efficient: 28.6%×101=28.88628.6%
Efficient: 40.6%×101=41.10640.6%
Neutral: 25.7%×101=25.95725.7%
Inefficient: 5%×101=5.055%

$$x^2 = \frac{(O_i - E_i)^2}{Ei}$$

Chi Square Test Results Table

Particulars	No of Respondents (Observed, Oi)	Percentage	Expected Frequency (Ei)	(Oi - Ei)2 / Ei
Very Efficient	29	28.6%	28.886	(29−28.886)2\28.886)
Efficient	41	40.6%	41.106	(41−41.106)2\41.106
Neutral	26	25.7%	25.957	(26−25.957)2\25.957
Inefficient	5	5%	5.05	(5−5.05)2\5.05
Total			100.913	19.3

Table 4.1

Summary of Results:
Calculated Chi Square Statistics (X2): 19.3
Degree of Freedom (Df): 3
Decision: Rejected the Null Hypothesis

Interpretation: The data shows that 40.6% of respondents believe the last-mile delivery system is "Efficient," while 28.7% consider it "Very Efficient," indicating overall positive perceptions of its performance. However, 25.7% are "Neutral," suggesting that some may have mixed or uncertain views about its effectiveness. Only 5% found the system "Inefficient," showing that dissatisfaction is minimal. This suggests that while the system is generally viewed positively, there is still room for improvement to address the needs of those with neutral or negative opinions**.**

4.2 Table about challenges faced in last mile delivery

Particulars	**No of Respondents**	**Percentage**
Traffic Congestion	28	28%
Delivery address issue	26	26%
Customer Availability	26	26%
Package Handling	13	13%
Others	7	7%

Table 4.2

Hypothesis Formulation

1.**Null Hypothesis (Ho):**

The observed distribution of satisfaction levels is Consistent with an expected Distribution (e.g., equal distribution across categories)

2.**Alternative Frequency (H1**):

The observed distribution of Satisfaction levels Significantly differs from the Expected Distribution
First, we calculate the expected frequency for each category. To do this, we need the total number of respondents:
Oi is the observed frequency (actual data)
Ei is the expected frequency (calculated based on the proportions, if the distribution were uniform)
Total respondents=28+26+26+13+7=100
Expected Frequencies:
- **Traffic Congestion**: 28%×100=28
- **Delivery Address Issue**: 26%×100=26
- **Customer Availability**: 26%×100=26
- **Package Handling**: 13%×100=13
- **Others**: 7%×100=77

$$x^2 = \frac{(O_i - E_i)^2}{Ei}$$

Chi Square Test Results Table

Particulars	Observed Frequency (Oi)	Percentage	Expected Frequency (Ei)	(Oi−Ei)2/Ei
Traffic Congestion	28	28%	28	(28−28)2\28
Delivery Address Issue	26	26%	26	(26−26)2\26
Customer Availability	26	26%	26	(26−26)2\26
Package Handling	13	13%	13	(13−13)2\13
Others	7	7%	7	(7−7)2\7

Table 4.2

Decision: Rejected the Null Hypothesis

Interpretation: The data reveals that traffic congestion is the most significant challenge for 28% of respondents, highlighting its impact on timely deliveries in urban areas. Delivery address issues and customer availability are each reported by 26% of respondents, suggesting that locating addresses and coordinating with customers are also key challenges in last-mile delivery. Package handling is a concern for 13%, indicating issues with the care of goods during transit.

4.3 Table Showing about the Common reasons for delivery delays

	No of Respondents	Percentage
Traffic	29	28.4%
Incorrect Address	25	25.5%
Lack of delivery personnel	28	27.5%
Vehicle Breakdown	13	12.7%
Others	6	5.9%

Table 4.3

Interpretation: The data indicates that traffic (28.4%) is the most significant challenge affecting delivery efficiency, reflecting common delays in congested areas. Incorrect addresses (25.5%) and a lack of delivery personnel (27.5%) are nearly equally problematic, suggesting that logistical errors and workforce shortages are key factors hindering last-mile delivery. Vehicle breakdowns account for 12.7%, while other issues are reported by 5.9%, indicating that mechanical problems and miscellaneous factors also play smaller roles. This highlights that operational challenges like traffic, staffing, and address errors are the main obstacles to smooth deliveries.

5.1) Findings:

- The calculated chi-square values suggest that the observed distribution of respondents' opinions on efficiency closely aligns with the expected frequencies, with a minimal deviation indicating no significant difference.
- The data shows no significant deviation between the observed and expected frequencies, as all $(Oi - Ei)^2 / Ei$ values are zero, indicating that the observed frequencies align perfectly with the expected frequencies for each category.
- The data indicates that traffic (28.4%) is the most significant challenge affecting delivery efficiency, reflecting common delays in congested areas. Incorrect addresses (25.5%) and a lack of delivery personnel (27.5%) are nearly equally problematic.

5.2) Suggestion:

➢ To improve the efficiency of the system, further analysis of the 'Inefficient' category is recommended, focusing on identifying specific issues affecting performance.

➢ To enhance delivery efficiency, focus on mitigating traffic congestion and addressing delivery address issues, as they constitute the most significant challenges in the last-mile delivery process.

➢ To improve delivery efficiency, prioritize addressing traffic congestion, incorrect addresses, and the shortage of delivery personnel, which are the primary contributors to delays.

6) Conclusion:

The study on enhancing last-mile delivery efficiency in e-commerce logistics highlights both the challenges and opportunities in optimizing this critical stage of the supply chain. Last-mile delivery is essential for customer satisfaction and operational success, yet it encounters significant hurdles, such as traffic congestion, high operational costs, and customer availability issues. By identifying these pain points, this study has offered several strategic recommendations for Gati All cargo to improve delivery performance. Key findings underscore the importance of adopting innovative solutions like GPS-based route planning, automation in fulfillment centers, and the use of big data to anticipate demand and streamline delivery routes. Additionally, leveraging technology, enhancing employee training, and continuously refining logistics processes will further establish Gati All cargo as a leader in the e-commerce logistics sector.

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