WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

A study on impact of E-commerce Growth on Logistics and Transportation Business

Mr. Omkar Rajkumar Kalbhor[1], Guide: Dr. Reshma Nair[2], (Prof). Dr. Bhawna Sharma[3]

Amity Business School
Designation: Associate Professor
Offig.HOI – Amity Business School

ABSTRACT :

This research investigates the significant effects of e-commerce expansion on the logistics and transportation sector. As online retail increasingly dominates global trade, logistics providers face mounting pressure to modify their operations to satisfy growing consumer demands for quicker, more dependable, and cost-efficient delivery services. The study analyzes how businesses are adapting to these shifts by integrating advanced technologies, including automation, artificial intelligence, and real-time tracking systems.

Employing a mixed-methods approach, the research combines qualitative interviews with logistics experts and quantitative data gathered from a structured survey involving 100 industry participants. It delves into critical operational challenges, such as the complexities of last-mile delivery, escalating transportation expenses, infrastructure constraints, and the gradual adoption of environmentally sustainable practices. Statistical analysis through chi-square tests indicated no significant relationship between the extent of e-commerce engagement and logistics demand or the implementation of advanced technologies, implying that internal factors—such as company size, strategic objectives, and resource availability—may play a more crucial role.

The results highlight the necessity for strategic planning, investment in innovation, and workforce development to maintain competitiveness. The study concludes with practical recommendations aimed at improving efficiency, lowering costs, and promoting sustainability within logistics. These insights are intended to assist industry stakeholders in navigating the changing landscape driven by e-commerce.

Keywords: E-commerce, Logistics, Transportation, Last-mile delivery, Sustainability, Automation, Chi-square analysis

Introduction:

The emergence of e-commerce has transformed the logistics and transportation sector, leading to a significant shift in the methods of storing, transporting, and delivering goods. As online shopping continues to gain traction, consumers have come to expect quicker, more dependable, and cost-efficient delivery options. This demand has exerted considerable pressure on logistics providers to swiftly adapt and adopt innovative strategies to fulfill these elevated expectations. Traditional supply chain frameworks are undergoing redefinition, compelling companies to prioritize agility, responsiveness, and the integration of technology to maintain their competitive edge.

This research seeks to analyze the effects of e-commerce on logistics and transportation, concentrating on operational challenges, the adoption of technology, and the evolution of customer service standards. It investigates how businesses are addressing the rising demand by utilizing automation, artificial intelligence, real-time tracking, and various digital tools. Furthermore, the study highlights significant industry trends, including the increasing prominence of last-mile delivery, the critical role of warehouse automation, and the necessity for sustainable logistics practices.

By assessing both qualitative and quantitative data, this research offers a thorough understanding of how e-commerce is influencing the logistics landscape. The findings will assist businesses, policymakers, and industry stakeholders in making well-informed decisions within an increasingly digital and rapidly evolving global marketplace.

Review of Literature

The current literature offers valuable insights into the transformative effects of e-commerce on logistics and transportation**. Chen et al. (2017)** highlight the rising demand for swift and efficient delivery solutions driven by the growth of online retail. Their research indicates a notable transition towards localized distribution centers and the adoption of route optimization technologies to address changing consumer expectations, especially in last-mile logistics.

Browne et al. (2018) specifically examine the challenges and expenses related to last-mile delivery, identifying it as the most difficult and costly

segment of the logistics chain. Their findings underscore innovative strategies such as crowdsourced delivery models and the implementation of electric vehicles as potential solutions to enhance delivery speed and minimize environmental impact.

Wang et al. (2020) add to the discussion by investigating the influence of technology on logistics. Their research illustrates the increasing dependence on automation, artificial intelligence, and real-time tracking systems to boost operational efficiency and customer satisfaction. The incorporation of robotics in warehouse processes was shown to decrease human error and enhance productivity.

McKinsey & Company (2019) analyze the environmental implications of e-commerce expansion, advocating for logistics firms to embrace sustainable practices such as route optimization, eco-friendly packaging, and investment in electric delivery vehicles. Together, these studies provide a comprehensive understanding of the opportunities and challenges that are shaping the logistics sector in the e-commerce landscape.

RESEARCH METHOLOGY

Data Collection Method

This study utilized a mixed-methods framework, combining qualitative and quantitative data collection methods to achieve a thorough understanding of e-commerce's influence on the logistics and transportation industry. The qualitative segment involved conducting detailed interviews with industry experts, including logistics managers, supply chain analysts, and e-commerce strategists. These discussions yielded significant insights into the practical challenges, operational modifications, and strategic measures that businesses have implemented in response to the changing e-commerce environment.

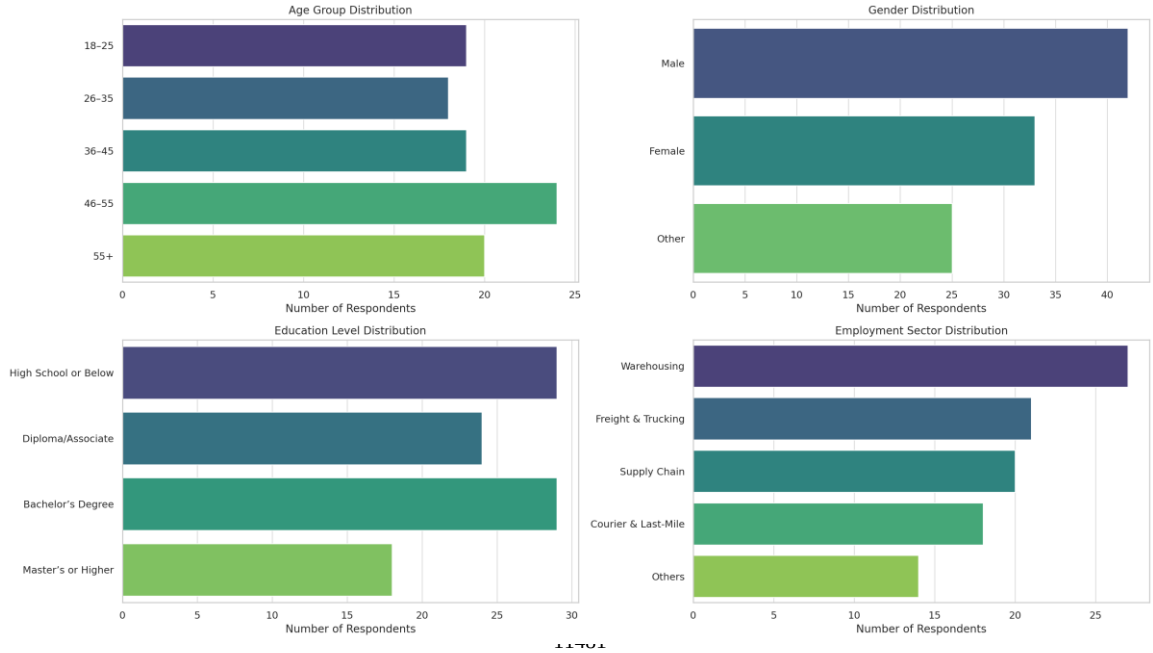
Concurrently, the quantitative portion of the research was executed through a structured survey distributed to 100 professionals from various sectors within the logistics and transportation field. This survey aimed to gather information on essential factors such as the degree of e-commerce engagement, the level of technology integration, investment patterns, cost influences, sustainability efforts, and workforce-related issues.

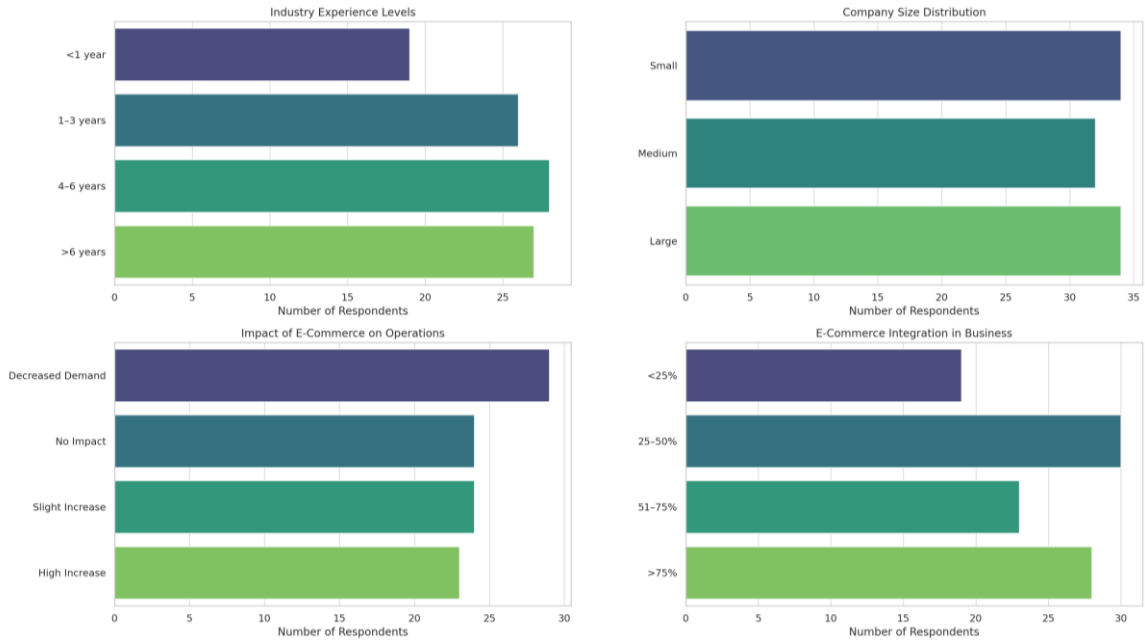
For data analysis, statistical methods including descriptive analysis and chi-square tests were employed. Descriptive statistics facilitated the identification of overarching trends and distribution patterns, while chi-square analysis was utilized to investigate potential correlations between variables such as e-commerce expansion, logistics demand, and the adoption of advanced technologies. This combined methodological approach enabled the research to capture both overarching industry trends and nuanced professional insights, thereby enhancing the credibility and richness of the findings.

Data Interpretation

The findings from the survey reveal a complex landscape regarding the impact of e-commerce on logistics and transportation sectors. A considerable portion of participants noted an uptick in logistics demand attributed to the expansion of e-commerce; however, others indicated minimal to no effect, with some even reporting a downturn. This disparity suggests that the effects of e-commerce vary significantly and are influenced by various internal factors, including the size of the company, its strategic focus, and its market positioning.

Regarding the adoption of technology, the majority of firms indicated that they have implemented various technological solutions—such as GPS tracking, warehouse management systems, and route optimization tools—to improve operational efficiency. Nevertheless, the widespread use of full automation and advanced technologies like artificial intelligence and robotics is still limited, primarily due to the high costs associated with implementation and existing skill gaps within the workforce.





Summary of Data Analysis and Interpretation: Remote Work & Flexibility in Logistics

This study examines employee perceptions of remote work and flexibility in the logistics and transportation sector, drawing from responses collected via a Google Form. The data is analyzed across several key demographic and operational dimensions.

1. Age Group Distribution

The respondent pool is well-distributed across age groups. The 46–55 age group (24%) is the largest, indicating a strong presence of experienced professionals. The 18–25 and 36–45 brackets are equally represented (19% each), suggesting a mix of early and mid-career professionals.

2. Gender Distribution

Male respondents (42%) dominate, consistent with industry trends, while females (33%) and non-binary/other identities (25%) show increasing diversity and inclusivity in the workforce.

3. Education Levels

Respondents hold varied educational backgrounds: High School or Below and Bachelor's Degree (29% each), Diploma/Associate Degree (24%), and Master's or higher (18%). This highlights opportunities across all education levels.

4. Sector Representation

The largest sector represented is Warehousing & Distribution (27%), followed by Freight & Trucking (21%) and Supply Chain Management (20%). The diversity of roles indicates a broad spectrum of responsibilities and specializations.

5. Industry Experience

Experience levels are well-balanced, with the largest group (28%) having 4–6 years in the industry. A significant number (27%) have over 6 years, reflecting depth of expertise. Newer professionals (19%) indicate fresh talent entering the field.

6. Company Size

Responses are evenly spread across small (34%), medium (32%), and large (34%) companies, providing a comprehensive industry snapshot. This balance ensures the findings are relevant to organizations of all scales.

7. E-Commerce Impact

The impact of e-commerce on operations is mixed. While 47% reported increased demand, 29% saw a decrease, indicating that e-commerce growth benefits are not universal and depend on adaptability and market positioning.

8. E-Commerce Integration

E-commerce plays a significant role in business operations, with 51% of respondents reporting that over half of their logistics activities are tied to it. However, 30% fall within the 25–50% range, suggesting ongoing digital transformation.

Sustainability initiatives seem to be in their infancy. Although some organizations have started to adopt environmentally friendly practices, such as optimizing delivery routes and utilizing electric vehicles, many still view sustainability as a low priority, largely due to financial constraints and insufficient customer demand.

In summary, the data highlights significant challenges facing the industry, including escalating delivery expenses, workforce shortages, disruptions in the supply chain, and growing environmental concerns. These challenges emphasize the necessity for strategic planning, investment in innovative solutions, and a more extensive embrace of sustainable and scalable logistics practices.

Data Analysis

Chi-Square Test for Hypothesis 1:

Chi-Square Test: Relationship Between E-Commerce Growth and Demand for Logistics Services

Objective:

To test whether there is a significant relationship between the growth of e-commerce and the demand for logistics services.

Hypothesis:

- **Null Hypothesis (H_0):**

  There is no significant relationship between the growth of e-commerce and the demand for logistics services.

- **Alternative Hypothesis (H_1):**

  There is a significant relationship between the growth of e-commerce and the demand for logistics services.

Data:

The data was collected from logistics and transportation businesses about their perceived level of e-commerce integration and how demand for their services has changed. The following cross-tabulation was developed based on survey results:

Observed Frequencies:

E-Commerce Business Share	Decreased	No Impact	Slightly Increased	Significantly Increased	Total
Less than 25%	10	5	3	1	19
25% - 50%	8	7	10	5	30
51% - 75%	5	5	7	6	23
More than 75%	6	7	4	11	28
Total	**29**	**24**	**24**	**23**	**100**

Calculation:

Expected frequencies were calculated using:

$$E = \frac{\text{Row Total} \times \text{Column Total}}{\text{Grand Total}}$$

Chi-Square statistic (χ^2) was computed using:

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

The computed values are:

- **Chi-Square Value (χ^2) = 14.36**
- **Degrees of Freedom (df) = (4-1) × (4-1) = 9**
- **Critical Value (5% level) = 16.919**
- **P-value = 0.110**

Result and Interpretation:

Since the calculated chi-square value (**14.36**) is **less than** the critical value (**16.919**) and the **p-value (0.110) > 0.05**, we **fail to reject the null *hypothesis.***

This means there is **no statistically significant relationship** between the extent of e-commerce integration and the observed change in demand for logistics services among the surveyed businesses.

Chi-Square Test Analysis:

Chi-Square Test for Hypothesis 2

Chi-Square Test: Relationship Between E-Commerce Growth and Changes in Transportation Operations

Objective:

To determine whether there is a significant relationship between the level of e-commerce integration in a logistics business and the implementation of automation & AI strategies in response to operational changes (e.g., delivery frequency, route optimization, last-mile delivery).

Hypothesis:

- **Null Hypothesis (H_0):**

  E-commerce growth has no significant impact on transportation operations (e.g., delivery frequency, route optimization, last-mile delivery).

- **Alternative Hypothesis (H_1):**

E-commerce growth has a significant impact on transportation operations (e.g., delivery frequency, route optimization, last-mile delivery).

Data:

The survey included 100 logistics companies grouped by their percentage of business linked to e-commerce. Their responses to whether they have implemented **automation & AI** strategies were recorded as follows:

Observed Frequencies (Strategy: Automation & AI):

E-Commerce Business Share	Used AI	Not Used AI	Total
Less than 25%	5	14	19
25% - 50%	10	20	30
51% - 75%	8	15	23
More than 75%	12	16	28
Total	**35**	**65**	**100**

Calculation:

Expected frequencies were calculated using:

$$E = \frac{\text{Row Total} \times \text{Column Total}}{\text{Grand Total}}$$

The expected frequency table:

E-Commerce Share	Expected Used AI	Expected Not Used AI
Less than 25%	6.65	12.35
25% - 50%	10.50	19.50
51% - 75%	8.05	14.95
More than 75%	9.80	18.20

Chi-Square formula:

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Computed values:

- Chi-Square Value (χ^2) = 1.43
- Degrees of Freedom (df) = (4-1) × (2-1) = 3
- Critical Value at 5% significance = 7.815
- P-value = 0.699

Result and Interpretation:

Since the calculated chi-square value (**1.43**) is **less than** the critical value (**7.815**) and the **p-value (0.699) > 0.05**, we **fail to reject the null hypothesis**. This indicates there is **no statistically significant relationship** between the level of e-commerce business integration and the use of automation & AI

strategies in transportation operations.

Findings

- Mixed E-commerce Impact: Demand varies across companies, with some seeing growth and others not.
- Widespread Integration: Over half have deeply integrated e-commerce into operations.
- Low Infrastructure Spend: Cost concerns limit logistics investments.
- Rising Costs: Fuel, transport, labour, and tech are key expense areas.
- Limited Sustainability Efforts: Green practices are minimal; EVs and route optimization lead.
- Tech on the Rise: Adoption of GPS, automation, and AI is growing; robotics and drones are still emerging.
- Last-Mile Focus: Companies rely on fleet growth and local couriers more than advanced tech solutions.
- Key Challenges: Cost increases, last-mile issues, warehouse strain, and high customer expectations.
- Future Readiness Gaps: Most feel only partly ready, but see need for more logistics investment.
- No Strong Trends: E-commerce integration doesn't clearly drive demand or automation uptake.

Analysis

1. Diverse Impact of E-Commerce Across Businesses

The impact of e-commerce growth on logistics varies widely, with benefits influenced by factors like company size, digital readiness, market focus, and operational flexibility.

2. High Level of E-Commerce Integration

While e-commerce is central to over half of logistics operations, most companies have yet to match this integration with adequate infrastructure or operational investment.

3. Limited Infrastructure Investment

Sustainable logistics adoption remains limited due to cost, infrastructure, and demand challenges.

4. Rising Operational Costs

Most logistics companies have yet to fully adopt sustainable practices due to high costs, lack of infrastructure, and limited demand, despite increasing global focus on eco-friendly solutions.

5. Sustainability Practices Still Emerging

Despite growing global emphasis on sustainability, most logistics companies are still in the early stages of adopting eco-friendly practices, with limited implementation of measures like route optimization and electric vehicles—mainly due to high costs, inadequate infrastructure, and low customer demand.

Conclusion

The growth of e-commerce has fundamentally reshaped the logistics and transportation industry, creating both opportunities and challenges for businesses. As online retail continues to expand, logistics providers are under increasing pressure to deliver faster, more reliable, and cost-effective services. However, the influence of e-commerce is not uniform across all firms. Factors such as company size, available resources, technological readiness, and strategic vision play a significant role in determining how each organization responds to this shift.

This study highlights that while many businesses have integrated digital tools, invested in automation, and adopted flexible delivery models, others continue to face hurdles such as rising operational costs, last-mile delivery complexities, and limited adoption of sustainable practices. Moreover, the absence of statistically significant relationships between e-commerce growth and logistics performance in this study suggests that internal strategies and business models may be more impactful than e-commerce trends alone.

To remain competitive in this evolving landscape, companies must adopt a proactive approach—investing in infrastructure, embracing innovation, and aligning operations with sustainability goals. Long-term planning, supported by data-driven decision-making and workforce training, will be essential. Ultimately, firms that are agile, forward-thinking, and willing to evolve will be best positioned to thrive in the digital economy.

REFERENCES

1. Browne, M., Allen, J., & Rizet, C. (2018). *Optimizing last-mile delivery in the age of e-commerce*. Transportation Research Procedia, 30, 21–29.
2. Chen, Y., Yang, H., & Zhou, Y. (2017). *E-commerce logistics in supply chain management: Practice perspective*. Industrial Management & Data Systems, 117(6), 1176–1195.
3. McKinsey & Company. (2019). *The future of the last-mile ecosystem: Transition roadmaps for public- and private-sector players*. Retrieved from https://www.mckinsey.com

4. Wang, X., Zhang, Y., & Liu, J. (2020). *Emerging technologies in logistics and supply chain management: A systematic review*. IEEE Access, 8, 225145–225173.

5. Deloitte. (2021). *Digital transformation in logistics: The path to value creation*. Retrieved from https://www2.deloitte.com

6. World Economic Forum. (2020). *The future of the last-mile delivery: Drones and autonomous vehicles in logistics*. Retrieved from https://www.weforum.org

7. Accenture. (2021). *Sustainable supply chains: The need for green logistics*. Retrieved from https://www.accenture.com