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A STUDY ON THE IMPACT OF LAST-MILE DELIVERY EFFICIENCY ON CUSTOMER SATISFACTION AND COST OPTIMIZATION IN QUICK COMMERCE (Q-COMMERCE)

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ABSTRACT

In the rapidly evolving landscape of Q-Commerce, where ultra-fast delivery services are redefining consumer expectations, customer satisfaction with last-mile delivery has emerged as a critical success factor. This study investigates the key determinants influencing customer satisfaction, with a specific focus on the behavior and professionalism of delivery personnel. The research integrates perspectives on operational efficiency, technological advancements, and cost expectations to understand their collective impact on last-mile service satisfaction.

Using data collected through a structured questionnaire (N=184), the study employs descriptive statistics, Pearson correlation, regression analysis, and ANOVA to examine relationships among variables. Findings reveal that factors such as real-time order tracking, fast delivery, and timely notifications significantly contribute to satisfaction levels. However, excessive or ineffective communication and delivery cost concerns can negatively influence customer perception.

The regression model yielded a high R^2 value of 0.765, indicating a strong explanatory power of the combined predictors. The results emphasize the importance of balancing speed, technology, and cost-effectiveness to improve customer experience. This research provides actionable insights for Q-Commerce platforms aiming to optimize their last-mile delivery strategies and enhance overall service quality.

KEYWORDS

- *Q-Commerce*
- *Last-Mile Delivery*
- *Customer Satisfaction*
- *Operational Efficiency*
- *Technological Factors*
- *Cost Optimization*
- *Real-Time Tracking*
- *Delivery Personnel*
- *Ultra-Fast Delivery*
- *Consumer Expectations*
- *Logistics Management*
- *Regression Analysis*
- *ANOVA*
- *E-commerce Delivery*
- *Service Quality*

INTRODUCTION

The landscape of retail and consumer behavior has witnessed a transformative shift with the emergence of Q-Commerce (Quick Commerce), a model that prioritizes ultra-fast delivery — often within minutes or a few hours. Driven by evolving customer expectations for speed, convenience, and reliability, Q-Commerce has disrupted traditional supply chain and logistics operations, placing an increased emphasis on the effectiveness of last-mile delivery.

Last-mile delivery, defined as the final step of the delivery process from a distribution center to the end consumer, plays a pivotal role in shaping overall customer satisfaction. It is not only a key differentiator in the competitive online retail environment but also a major cost and resource-intensive segment of the supply chain. In the Q-Commerce context, where time is of the essence, customer satisfaction depends heavily on the efficiency, transparency, and professionalism demonstrated during this final leg of the delivery.

This study seeks to explore the various operational, technological, and cost-related factors that influence customer

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satisfaction with last-mile delivery services in Q-Commerce. Particular attention is given to aspects such as the behavior and professionalism of delivery personnel, the accuracy and usefulness of real-time tracking systems, timely updates and notifications, and consumer preferences regarding delivery speed versus cost. Through statistical analysis including descriptive statistics, correlation, regression, and ANOVA, the study aims to identify key predictors of satisfaction and provide insights for enhancing customer experience in the Q-Commerce sector.

LITERATURE REVIEW

This study reveals that late deliveries increase and early deliveries decrease repurchase intervals in Quick Commerce. Customer satisfaction mediates this effect, highlighting the importance of accurate delivery timing for retention strategies (Harter et al., 2024). The study explores the logistical and urban impact of Q-Commerce, especially the role of dark stores and two-wheeler deliveries in dense cities like Paris. It highlights concerns over public space usage and transportation intensity, calling for deeper scientific analysis (Buldeo Rai et al., 2023). This case analyzes India's growing quick commerce sector using strategic frameworks like Porter's Five Forces and Blue Ocean Strategy. It explores market disruption, synergy from acquisitions, and the challenges of scaling in a high cash burn environment (Singh, 2023). The study addresses network optimization for quick commerce by proposing an efficient micro-fulfillment center (MFC) strategy using location-routing models. It shows that flexible lead times and smaller, distributed MFCs significantly reduce fulfillment costs while maintaining service speed (Yang et al., 2024). This research on the Astro Q-Commerce app found that e-service quality and e-WoM significantly influence e-trust and purchase decisions, while perceived ease of use has no major impact. E-trust plays a mediating role, highlighting the need for strong service reliability and user feedback management (Royanti & Astini, 2023). This study from Indonesia found that e-service quality dimensions—like safety, reliability, and convenience—have a positive impact on customer satisfaction and e-loyalty in Quick Commerce. It highlights key service factors influencing repeat usage and trust in Q-Commerce platforms (Setiyono et al., 2023). This study used sentiment analysis on 3,027 app reviews to uncover six key customer emotions toward Q-Commerce platforms, ranging from positive to constraining and uncertain. It highlights how review analytics can offer valuable business insights and drive competitive advantage (Kumar et al., 2022). This research proposes integrating Micro Fulfillment Centers (MFCs) with retail stores in an omnichannel system to tackle high costs and inefficiencies in Q-Commerce, especially for perishable goods. Using a two-stage optimization model, it shows that channel integration can significantly reduce operational costs under demand uncertainty (Lee et al., 2023). This study uses the Technology Acceptance Model (TAM) to identify key factors—perceived benefits, ease of use, social influence, and demographics—that influence users' intention to adopt Q-Commerce apps in India. The findings provide valuable insights for businesses to enhance user engagement and adoption (Deepthi & Bansal, 2023). This study examines consumer behaviour in India's growing FMCG sector, focusing on how factors like quick commerce, online shopping, and mall experiences influence purchasing decisions. The findings reflect the sector's recovery and evolving shopping habits driven by price sensitivity and convenience (Sharma, 2022). This study presents an integrated analytical framework for quick-commerce order fulfillment, covering picking, batching, and last-mile delivery to balance cost and service quality. It shows that ensuring high delivery reliability significantly increases costs, but is critical for setting realistic and reliable delivery times (Raj et al., 2024). This paper explores Q-commerce as an emerging business model born from the integration of digital technologies and fast physical delivery. It highlights how urbanization and COVID-19 restrictions accelerated its adoption, shaping the future of online product exchange (Stojanov, 2022). This case analyzes the growth and competitive dynamics of the Hyperlocal Grocery Delivery Industry in India, focusing on Dunzo and Blinkit. It examines how technological innovation and platform strategies shape business models in emerging economies with infrastructural and institutional challenges (Sanghi et al., 2024). Quick commerce has revolutionized the retail sector by promising ultra-fast delivery using city-based dark stores and bike couriers. However, this "battle of the deadline" fuels urgency culture and raises logistical and regulatory tensions, especially across European cities (Pache, 2023). The quick commerce sector is rapidly expanding, with startups like Getir promising grocery delivery within 10–15 minutes. Berker Yağci highlights both the immense opportunities and operational challenges involved in maintaining such speed and efficiency (Eisenberg & Yağci, 2022). Quick commerce (Q-commerce) revolutionizes e-commerce by offering ultrafast deliveries within 10–15 minutes, requiring dense urban networks of dark stores. However, its limited product assortment and high logistical demands pose strategic constraints on retailer offerings (Paché, 2022). This study explores business growth opportunities in the pet industry using design thinking and interviews with pet owners. It proposes *Petway*, a quick-commerce app offering fast, affordable delivery of pet essentials, addressing key consumer pain points ("Business Model Using Design Thinking Concept for Pet Industry in Indonesia," 2023). This literature review explores the implementation of QRIS (Quick Response Code Indonesian Standard) in MSMEs, highlighting its role in digital payment adoption. It examines MSME readiness, challenges, and the benefits of QRIS in enhancing income and enabling server-based e-commerce (Nada et al., 2021). This quantitative study explores opportunities and challenges in South Asia's q-commerce industry, emphasizing factors influencing consumer decisions—pricing, convenience, and security. Despite concerns about data privacy, customers prefer q-commerce for its time-saving benefits and ease, even at higher prices (Ahmed & Shafighi, 2022). This paper explores emerging last-mile delivery concepts like drones and autonomous robots, addressing urban congestion and environmental concerns caused by rising e-commerce demand. It emphasizes decision-making challenges in implementing these solutions and highlights operations research methods and future research directions (Boysen et al., 2021). This UK-based longitudinal study investigates factors influencing the adoption of express delivery services using an extended UTAUT model. Findings reveal that delivery reliability significantly impacts customer intention, while delivery speed and effort expectancy

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do not, and facilitating conditions surprisingly show a negative effect (Zhong et al., 2022). This study investigates determinants of efficient last-mile delivery in Nigeria's healthcare sector using data from KADSHMA and health facilities. It finds that delivery cost, time, mode, and facility technology positively influence efficiency, while a diverse product mix negatively affects it (Miko & Abbas, 2024). This systematic literature review analyzes 281 journal articles from 2005–2020 to explore five dimensions of last-mile delivery and highlights that most research focuses on operational aspects, with limited integration of sustainability at tactical and strategic levels. A conceptual framework is proposed to guide future research on incorporating economic, environmental, and social sustainability in last-mile logistics (Ha et al., 2023). This study uses a discrete choice experiment among Norwegian females to explore preferences for sustainable last-mile delivery in clothing rentals, revealing that consumers are willing to trade faster delivery for lower emissions and value environmental sustainability alongside convenience. These insights can guide urban planners and retailers in promoting greener delivery options beyond just pricing incentives (Caspersen & Navrud, 2021). This study analyzes the feasibility of drone-based last-mile delivery in Milan, highlighting drones as a sustainable, fast, and congestion-free option for transporting small packages. Survey data and financial analysis reveal user acceptance and potential profitability for companies offering such services (Borghetti et al., 2022). This study explores the use of cargo bicycles for last-mile delivery in Medellín, Colombia, emphasizing their low-cost, eco-friendly benefits in urban areas with infrastructure challenges. Survey data from courier companies and carriers highlight topographical and operational factors critical to optimizing cargo bike logistics in similar developing cities (Gonzalez-Calderon et al., 2022). This study investigates Crowd Logistics Delivery (CLD) as a last-mile solution in Saudi Arabia, analyzing its business models (B2B, B2C, C2C), implementation, benefits, and limitations through stakeholder interviews. Key challenges include legislation, trust, supply of drivers, and cultural factors, while benefits span economic and social impact (Alharbi et al., 2022). This study explores how last-mile delivery impacts customer satisfaction in e-retail, using a survey conducted in Sweden. It finds that last-mile delivery experience significantly mediates the link between customers' online shopping perceptions and overall satisfaction (Vakulenko et al., 2019). This study introduces the Capacitated Delivery Problem with Parking (CDPP), a routing model that incorporates parking time into last-mile delivery optimization. Results show that accounting for parking significantly improves delivery efficiency, especially when parking time is high (Reed et al., 2024). This paper presents a smart predict-then-optimize framework integrating machine learning with vehicle routing to enhance last-mile food delivery performance. By minimizing decision error rather than prediction error, the method improves order assignment and routing accuracy, yielding about a 5% performance boost (Chu et al., 2023).

OBJECTIVES

1.To analyze the role of last-mile delivery in the operational framework of Quick Commerce companies.
2.To evaluate the relationship between last-mile delivery speed and customer satisfaction in the Q-Commerce sector.
3.To identify key cost drivers associated with last-mile logistics in ultra-fast delivery models.
4.To examine the strategies used by Q-Commerce firms to optimize last-mile delivery costs without compromising service quality.
5.To assess consumer expectations and perceptions regarding delivery time, reliability, and convenience in urban areas.
6.To explore technological innovations (e.g., route optimization, delivery tracking, rider management) used in enhancing last-mile delivery efficiency.

7.To suggest best practices for balancing customer satisfaction and cost-effectiveness in last-mile operations within Q-Commerce.

RESEARCH METHODOLOGY

1. Data Collection

- **Method:** Primary data collected through a structured **Google Form questionnaire**.
- **Respondents:** Users of Q-Commerce (ultra-fast delivery) platforms such as Zepto, Blinkit, Swiggy Instamart, etc.
- **Sampling Technique:** Convenience sampling
- **Sample Size:** 186

2. Variables Used

Independent Variable (IV):

- Last-Mile Delivery Efficiency
  - Timely delivery
  - Behavior of delivery personnel
  - Delivery tracking and updates

Mediating Variables

- Operational & Technological Factors
- Cost-Related Perceptions

Dependent Variables (DVs)

- Customer Satisfaction
- Cost Optimization

Scale Used: 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree)

3. HYPOTHESES

H1: Last-Mile Delivery Efficiency has a significant positive impact on Customer Satisfaction.
H2: Last-Mile Delivery Efficiency positively influences Cost Optimization in Q-Commerce.
H3: Operational and Technological Factors mediate the relationship between Last-Mile Delivery and Customer Satisfaction.
H4: Cost-related perceptions mediate the relationship between Last-Mile Delivery and Cost Optimization.
This study aims to analyze the impact of last-mile delivery efficiency on customer satisfaction and cost optimization in the Q-Commerce sector. Data was collected through a structured questionnaire using a 5-point Likert scale. The responses have been coded and entered into SPSS for analysis. Key variables include delivery efficiency, operational factors, cost perceptions, and satisfaction. The analysis will help test the proposed hypotheses and identify significant relationships.

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A. Descriptive Statistics

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Section 1: Customer Satisfaction with Last-Mile Delivery Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 Note: Q-Commerce = Ultra-Speed Delivery Services [I receive my Q-Commerce deliveries within the promised time frame.]	184	4	5	4.57	.497	-.265	.179	-1.951	.356
Section 1: Customer Satisfaction with Last-Mile Delivery Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 Note: Q-Commerce = Ultra-Speed Delivery Services [I am satisfied with the behavior and professionalism of the delivery personnel.]	184	1	4	3.98	.221	-13.565	.179	184.000	.356

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Section 1: Customer Satisfaction with Last-Mile Delivery Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 Note: Q-Commerce = Ultra-Speed Delivery Services [The delivery tracking feature keeps me well informed.]	184	4	5	4.77	.421	-1.306	.179	-.299	.356
Section 1: Customer Satisfaction with Last-Mile Delivery Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 Note: Q-Commerce = Ultra-Speed Delivery Services [I consider fast delivery an important factor when choosing a Q-Commerce platform.]	184	3	5	4.93	.277	-4.128	.179	17.993	.356
Section 1: Customer Satisfaction with Last-Mile Delivery Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 Note: Q-Commerce = Ultra-Speed Delivery Services [Late deliveries negatively affect my trust in the service.]	184	4	5	4.78	.417	-1.343	.179	-.198	.356

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Section 1: Customer Satisfaction with Last-Mile Delivery Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 Note: Q-Commerce = Ultra-Speed Delivery Services [I am likely to switch to another app if delivery time becomes inconsistent.]	184	2	5	4.76	.476	-2.136	.179	5.881	.356
Section 2: Cost Optimization and Expectations Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [I am willing to pay extra for faster delivery.]	184	2	5	2.91	1.021	.269	.179	-1.814	.356
Section 2: Cost Optimization and Expectations Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [Delivery charges influence my purchase decision.]	184	2	5	3.65	1.168	-.456	.179	-1.301	.356

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Section 2: Cost Optimization and Expectations Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [I prefer free delivery even if it takes slightly longer.]	184	2	5	2.70	.870	.823	.179	-.640	.356
Section 2: Cost Optimization and Expectations Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [Discounts/offers on delivery charges increase my purchase frequency.]	184	4	5	4.78	.417	-1.343	.179	-.198	.356
Section 2: Cost Optimization and Expectations Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [I feel the current delivery fees charged by Q-Commerce platforms are reasonable.]	184	3	5	3.99	.165	-1.125	.179	34.694	.356
Section 3: Operational and Technological Factors Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [I find real-time order	184	4	5	4.57	.496	-.288	.179	-1.938	.356

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tracking helpful and accurate.]									
Section 3: Operational and Technological Factors Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [Notifications and updates about delivery status are timely.]	184	3	5	4.71	.468	-1.075	.179	-.421	.356
Section 3: Operational and Technological Factors Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [Iâ€™ve noticed improvements in delivery times in the past 6 months.]	184	3	5	4.55	.509	-.346	.179	-1.584	.356
Section 3: Operational and Technological Factors Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [I believe technology plays a major role in improving Q-Commerce delivery services.]	184	3	5	4.93	.296	-4.565	.179	22.126	.356
Valid N (listwise)	184								

Interpretation

The descriptive statistics of 184 respondents reveal high customer satisfaction with Q-Commerce last-mile delivery services. Respondents strongly agreed that deliveries arrive within the promised time (Mean = 4.57, SD = 0.497) and considered fast delivery a crucial factor when choosing a platform (Mean = 4.93, SD = 0.277). Tracking features were found useful (Mean = 4.77, SD = 0.421), and late deliveries significantly impacted trust (Mean = 4.78, SD = 0.417). Additionally, many users indicated they would switch apps if delivery times became inconsistent (Mean = 4.76, SD = 0.476). On cost-related aspects, fewer respondents were willing to pay extra for faster delivery (Mean = 2.91, SD = 1.021), and many preferred free delivery even if slower (Mean = 2.70, SD = 0.870). However, discounts and offers on delivery charges strongly influenced purchase frequency (Mean = 4.78, SD = 0.417). Operationally, respondents appreciated real-time order tracking (Mean = 4.57, SD = 0.496) and timely notifications

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(Mean = 4.71, SD = 0.468). Notably, there was strong agreement that technology plays a major role in improving delivery services (Mean = 4.93, SD = 0.296). Overall, while customer satisfaction and appreciation for technology are high, price sensitivity remains a key consideration.

B.Correlation

Correlations

		Section 1: Customer Satisfaction with Last-Mile Delivery Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 Note: Q-Commerce = Ultra-Speed Delivery Services [The delivery tracking feature keeps me well informed.]	Section 2: Cost Optimization and Expectations Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [Delivery charges influence my purchase decision.]
Section 1: Customer Satisfaction with Last-Mile Delivery Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 Note: Q-Commerce = Ultra-Speed Delivery Services [The delivery tracking feature keeps me well informed.]	Pearson Correlation	1	-.185*
	Sig. (2-tailed)		.012
	N	184	184
Section 2: Cost Optimization and Expectations Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [Delivery charges influence my purchase decision.]	Pearson Correlation	-.185*	1
	Sig. (2-tailed)	.012	
	N	184	184

*. Correlation is significant at the 0.05 level (2-tailed).

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Interpretation

A Pearson correlation was conducted to examine the relationship between customer satisfaction with the delivery tracking feature and the extent to which delivery charges influence purchase decisions in Q-Commerce services.

The analysis showed a negative correlation ($r = -0.185$, $p = 0.012$) between the two variables. This correlation is statistically significant at the 0.05 level, suggesting that as satisfaction with the delivery tracking feature increases, the influence of delivery charges on customer purchase decisions slightly decreases, and vice versa.

Although the correlation is weak, it indicates a subtle trend where customers who feel well-informed through tracking features may be less sensitive to delivery charges, possibly valuing service quality over cost.

Correlations

		Section 1: Customer Satisfaction with Last-Mile Delivery Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 Note: Q-Commerce = Ultra-Speed Delivery Services [I am satisfied with the behavior and professionalism of the delivery personnel.]	Section 3: Operational and Technological Factors Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [I find real-time order tracking helpful and accurate.]
Section 1: Customer Satisfaction with Last-Mile Delivery Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 Note: Q-Commerce = Ultra-Speed Delivery Services [I am satisfied with the behavior and professionalism of the delivery personnel.]	Pearson Correlation	1	-.064
	Sig. (2-tailed)		.387
	N	184	184
Section 3: Operational and Technological Factors Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [I find real-time order tracking helpful and accurate.]	Pearson Correlation	-.064	1
	Sig. (2-tailed)	.387	
	N	184	184

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Interpretation

A Pearson correlation analysis was conducted to examine the relationship between customer satisfaction with the behavior and professionalism of delivery personnel and their perception of real-time order tracking as helpful and accurate in Q-Commerce services.

The results indicate a very weak negative correlation ($r = -0.064$, $p = 0.387$) between the two variables. Since the p-value is greater than 0.05, this correlation is not statistically significant.

This means there is no meaningful relationship between how satisfied customers are with delivery personnel and how helpful they find the real-time tracking feature. These two aspects of the delivery experience appear to operate independently in customers' minds.

C. Regression

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.875[a]	.765	.757	.109	.765	95.904	6	177	.000

a. Predictors: (Constant), Section 3: Operational and Technological Factors
Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements.

Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [Notifications and updates about delivery status are timely.], Section 1: Customer Satisfaction with Last-Mile Delivery
Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements.

Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5

Note: Q-Commerce = Ultra-Speed Delivery Services [The delivery tracking feature keeps me well informed.], Section 1: Customer Satisfaction with Last-Mile Delivery
Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements.

Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5

Note: Q-Commerce = Ultra-Speed Delivery Services [I consider fast delivery an important factor when choosing a Q-Commerce platform.], Section 3: Operational and Technological Factors
Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements.

Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [I find real-time order tracking helpful and accurate.], Section 2: Cost Optimization and Expectations
Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements.

Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [I am willing to pay extra for faster delivery.], Section 2: Cost Optimization and Expectations
Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements.

Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [I prefer free delivery even if it takes slightly longer.]

Interpretation

The multiple linear regression model yielded an R value of 0.875, indicating a strong positive correlation between the selected predictors and the dependent variable. The R^2 value of 0.765 suggests that approximately 76.5% of the variance in the dependent variable can be explained by the combination of six independent variables. The Adjusted R^2 value of 0.757 confirms the model's robustness after accounting for the number of predictors.

The Standard Error of the Estimate is 0.109, showing relatively low dispersion around the regression line, indicating good model fit. The F-statistic ($F = 95.904$, $p < 0.001$) confirms that the model is statistically significant, meaning the predictors collectively have a meaningful impact on the outcome variable. The predictors included:

- Timeliness of delivery status notifications,
- Tracking feature keeping customers informed,
- Importance of fast delivery when choosing a platform,
- Helpfulness of real-time order tracking,
- Willingness to pay extra for faster delivery, and
- Preference for free delivery even if slower.

These variables together strongly explain customer satisfaction or decision-making in Q-Commerce services.

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D. ANOVA

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.845	6	1.141	95.904	.000[b]
	Residual	2.106	177	.012		
	Total	8.951	183			

a. Dependent Variable: Section 1: Customer Satisfaction with Last-Mile Delivery
Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements.

Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5

Note: Q-Commerce = Ultra-Speed Delivery Services [I am satisfied with the behavior and professionalism of the delivery personnel.]

b. Predictors: (Constant), Section 3: Operational and Technological Factors
Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements.

Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [Notifications and updates about delivery status are timely.], Section 1: Customer Satisfaction with Last-Mile Delivery
Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements.

Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5

Note: Q-Commerce = Ultra-Speed Delivery Services [The delivery tracking feature keeps me well informed.], Section 1: Customer Satisfaction with Last-Mile Delivery
Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements.

Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5

Note: Q-Commerce = Ultra-Speed Delivery Services [I consider fast delivery an important factor when choosing a Q-Commerce platform.], Section 3: Operational and Technological Factors
Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements.

Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [I find real-time order tracking helpful and accurate.], Section 2: Cost Optimization and Expectations
Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements.

Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [I am willing to pay extra for faster delivery.], Section 2: Cost Optimization and Expectations
Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements.

Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [I prefer free delivery even if it takes slightly longer.]

Interpretation

The ANOVA (Analysis of Variance) results indicate that the regression model is statistically significant. The F-value is 95.904 with a p-value of 0.000, which is less than 0.05, confirming that the overall model provides a significantly better fit than a model with no predictors.

- The Regression Sum of Squares is 6.845, indicating the variation in the dependent variable explained by the model.
- The Residual (error) Sum of Squares is 2.106, which is the variation not explained by the model.
- The Total Sum of Squares is 8.951, representing the total variation in the dependent variable.
- With 6 degrees of freedom for regression and 177 for residual, the model is built on a good sample size and number of predictors.

Conclusion

The model significantly explains variations in customer satisfaction (specifically with delivery personnel behavior and professionalism) based on operational, technological, and cost-related factors in Q-Commerce services.

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Volume: 11| Issue: 6| June 2025|| Journal DOI: 10.36713/epra2013 || SJIF Impact Factor 2025: 8.691 || ISI Value: 1.188

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	22.210	1.022		21.741	.000	20.194	24.226
	Section 1: Customer Satisfaction with Last-Mile Delivery Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 Note: Q-Commerce = Ultra-Speed Delivery Services [I consider fast delivery an important factor when choosing a Q-Commerce platform.]	2.180	.167	2.734	13.056	.000	1.850	2.509
	Section 1: Customer Satisfaction with Last-Mile Delivery Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 Note: Q-Commerce = Ultra-Speed Delivery Services [The delivery tracking feature keeps me well informed.]	-3.847	.243	-7.321	-15.843	.000	-4.327	-3.368
	Section 2: Cost Optimization and Expectations Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [I am willing to pay extra for faster delivery.]	.104	.050	.479	2.065	.040	.005	.203

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	Section 2: Cost	-1.611	.091	-6.337	-17.735	.000	-1.790	-1.431
	Optimization and Expectations Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [I prefer free delivery even if it takes slightly longer.]							
	Section 3: Operational and Technological Factors Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [I find real-time order tracking helpful and accurate.]	.828	.104	1.858	7.931	.000	.622	1.034
	Section 3: Operational and Technological Factors Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 [Notifications and updates about delivery status are timely.]	-2.199	.170	-4.658	-12.959	.000	-2.534	-1.864
a. Dependent Variable: Section 1: Customer Satisfaction with Last-Mile Delivery Instructions: On a scale of 1 to 5, please rate your 4ment with the following statements. Scale: 1 - 1, 2 - 2, 3 - 3, 4 - 4, 5 - 5 Note: Q-Commerce = Ultra-Speed Delivery Services [I am satisfied with the behavior and professionalism of the delivery personnel.]								

Interpretation

The regression analysis reveals several significant predictors of customer satisfaction with the behavior and professionalism of delivery personnel in Q-Commerce.

- The strongest positive predictors include:
  - "Fast delivery as an important factor" (B = 2.180, $p < 0.001$), indicating that customers who value speed of delivery tend to be more satisfied with delivery personnel.
  - "Real-time order tracking is helpful and accurate" (B = 0.828, $p < 0.001$), showing that technology and operational features enhance customer satisfaction.
  - "Willingness to pay extra for faster delivery" (B = 0.104, $p = 0.040$), suggesting a slight but significant positive influence on satisfaction levels.
- On the other hand, the model also highlights negative relationships:
  - "Delivery tracking keeps me well informed" (B = -3.847, $p < 0.001$), and "Notifications and updates are timely" (B = -2.199, $p < 0.001$) surprisingly show negative coefficients, which

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might suggest customer dissatisfaction due to poor execution despite the availability of these features.

- "Preference for free delivery even if slower" (B = -1.611, $p < 0.001$) negatively impacts satisfaction with delivery personnel, possibly due to lowered expectations tied to longer delivery windows.

Overall, the findings emphasize that while customers appreciate fast, accurate deliveries and are willing to pay extra for them, inconsistent communication and reliance on slower, free options may reduce satisfaction with delivery personnel—even if their service is otherwise professional.

DISCUSSION OF FINDINGS

The study aimed to analyze the key factors influencing customer satisfaction with last-mile delivery personnel behavior and professionalism in the Q-Commerce industry. Several statistical tools were employed, including descriptive statistics, correlation analysis, regression modeling, and ANOVA, to uncover the patterns and significance of various customer perceptions.

Descriptive statistics revealed relatively high mean scores for statements like the importance of fast delivery, real-time tracking accuracy, and delivery notifications, indicating strong customer preferences toward speed, visibility, and communication in the delivery process. Conversely, slightly lower mean scores for cost-related statements suggest more diverse views on willingness to pay for faster services.

Correlation analysis highlighted a significant negative correlation between delivery tracking features and purchase decisions influenced by delivery charges ($r = -0.185$, $p < 0.05$). This suggests that customers who value tracking features may be less concerned about delivery costs, possibly prioritizing convenience and control over pricing.

The multiple regression analysis showed a strong model fit ($R^2 = 0.765$), meaning that around 76.5% of the variation in customer satisfaction with delivery personnel can be explained by the selected independent variables, such as:

- Importance of fast delivery,
- Tracking accuracy,
- Timeliness of delivery updates,
- Willingness to pay for speed, and
- Preference for free delivery.

Among these:

- Fast delivery (B = 2.180, $p < 0.001$) and real-time tracking accuracy (B = 0.828, $p < 0.001$) had strong positive effects on satisfaction.
- Willingness to pay extra for faster delivery also had a mild but significant positive effect (B = 0.104, $p = 0.040$).
- Surprisingly, delivery tracking updates (B = -3.847) and notifications (B = -2.199) had significant negative coefficients, indicating that while these features are expected, poor implementation or over-notification might reduce satisfaction.
- A preference for free but slower delivery (B = -1.611, $p < 0.001$) negatively impacted satisfaction, aligning with expectations that speed is critical in Q-Commerce.

The ANOVA results further confirmed the overall significance of the regression model ($F = 95.904$, $p < 0.001$), validating that the combined independent variables have a statistically significant impact on customer satisfaction.

In conclusion, the findings reveal that speed, transparency, and delivery tracking accuracy are key drivers of customer satisfaction in Q-Commerce. However, it also underscores the importance of quality execution of technological features—merely offering tracking or notifications is not enough if they are not timely or useful. Furthermore, pricing expectations (whether customers prioritize speed over cost) play a subtle but crucial role in shaping satisfaction with delivery personnel. These insights are valuable for Q-Commerce platforms aiming to improve last-mile delivery experiences.

CONCLUSION

The study provides valuable insights into the factors influencing customer satisfaction with last-mile delivery personnel in Q-Commerce. The analysis confirms that operational efficiency, technological support, and cost expectations significantly affect how customers perceive delivery experiences.

From the descriptive statistics, it is evident that customers highly value fast delivery, accurate real-time tracking, and timely notifications, indicating a strong preference for speed and transparency. However, mixed responses around cost factors like paying extra or opting for free delivery suggest differing priorities among customer segments.

Correlation results indicate that while some technological features are positively associated with satisfaction, others—like excessive or ineffective delivery notifications—may lead to dissatisfaction if not properly managed.

The regression analysis shows a robust model ($R^2 = 0.765$), proving that a combination of speed, technology, and pricing expectations strongly predicts customer satisfaction. Key predictors such as fast delivery and real-time tracking had significant positive impacts, while poor execution of delivery updates and overemphasis on free slower delivery options had a negative influence.

The ANOVA test confirmed the statistical significance of the model ($p < 0.001$), reinforcing the reliability of these predictors in explaining customer satisfaction

Overall, the study concludes that for Q-Commerce firms to enhance last-mile satisfaction, they must prioritize speed, ensure high-quality and user-friendly tracking systems, and balance cost expectations with service quality. The professionalism and behavior of delivery personnel remain essential, but they are part of a broader ecosystem influenced by speed, communication, and convenience.

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QUESTIONNAIRE

1. Age*
   - Below 20
   - 21-30
   - 31-40
   - 41-50
   - Above 50

2.Gender*
   - Male
   - Female

3.Occupation*
   - Student
   - Working Professional
   - Self-Employed
   - Retired
   - Unemployed

4.Which Quick Commerce (Q-Commerce) platforms do you use most frequently? *
   - Zepto
   - Blinkit
   - Swiggy Instamart
   - Dunzo
   - Other:

5.What is the average delivery time you usually experience with Q-Commerce orders? *
   - Under 10 minutes
   - 10–20 minutes
   - 21–30 minutes
   - More than 30 minutes

6.Which factor influences your choice of Q-Commerce platform the most? *
   - Delivery speed
   - Product availability
   - Discounts and offers
   - Delivery charges
   - Brand reputation

7.Section 1: Customer Satisfaction with Last-Mile Delivery
Instructions: On a scale of 1 to 5, please rate your agreement with the following statements.
Scale: 1 - Strongly Disagree, 2 - Disagree, 3 - Neutral, 4 - Agree, 5 - Strongly Agree

Note: Q-Commerce = Ultra-Speed Delivery Services
*
   - Strongly Disagree
   - Disagree
   - Neutral
   - Agree
   - Strongly Agree

❖ I receive my Q-Commerce deliveries within the promised time frame.
❖ I am satisfied with the behavior and professionalism of the delivery personnel.
❖ The delivery tracking feature keeps me well informed.
❖ I consider fast delivery an important factor when choosing a Q-Commerce platform.
❖ Late deliveries negatively affect my trust in the service.
❖ I am likely to switch to another app if delivery time becomes inconsistent.

8.Section 2: Cost Optimization and Expectations
Instructions: On a scale of 1 to 5, please rate your agreement with the following statements.
Scale: 1 - Strongly Disagree, 2 - Disagree, 3 - Neutral, 4 - Agree, 5 - Strongly Agree
*
   - Strongly Disagree
   - Disagree
   - Neutral
   - Agree
   - Strongly Agree

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- ❖ I am willing to pay extra for faster delivery.
- ❖ Delivery charges influence my purchase decision.
- ❖ I prefer free delivery even if it takes slightly longer.
- ❖ Discounts/offers on delivery charges increase my purchase frequency.
- ❖ I feel the current delivery fees charged by Q-Commerce platforms are reasonable.

9.Section 3: Operational and Technological Factors
Instructions: On a scale of 1 to 5, please rate your agreement with the following statements.
Scale: 1 - Strongly Disagree, 2 - Disagree, 3 - Neutral, 4 - Agree, 5 - Strongly Agree
*

- o Strongly Disagree
- o Disagree
- o Neutral
- o Agree
- o Strongly Agree

- ❖ I find real-time order tracking helpful and accurate.
- ❖ Notifications and updates about delivery status are timely.
- ❖ I've noticed improvements in delivery times in the past 6 months.
- ❖ I believe technology plays a major role in improving Q-Commerce delivery services.

10.What improvements would you like to see in the delivery experience? *

- o Faster delivery time
- o Better communication and updates from delivery agents
- o Lower or no delivery charges
- o Improved product handling and packaging