

The Effect of Last Mile Delivery Performance on E-Commerce Customer Loyalty

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ABSTRACT

This study investigates the impact of last-mile delivery performance on customer loyalty in the e-commerce sector. Using a quantitative research approach with data collected from 386 e-commerce customers, we examine how delivery speed, delivery accuracy, and return handling influence customer loyalty. Multiple regression analysis reveals that all three independent variables significantly predict customer loyalty ($R^2 = 0.672$, $p < 0.001$). Delivery accuracy emerged as the strongest predictor ($\beta = 0.412$, $p < 0.001$), followed by return handling ($\beta = 0.298$, $p < 0.001$) and delivery speed ($\beta = 0.247$, $p < 0.001$). These findings provide valuable insights for e-commerce retailers and logistics providers seeking to enhance customer retention through improved last-mile delivery performance. The study contributes to the growing body of literature on e-commerce logistics and offers practical implications for strategic decision-making in supply chain management.

Keywords: last-mile delivery, customer loyalty, e-commerce, delivery speed, delivery accuracy,

INTRODUCTION

The exponential growth of e-commerce has fundamentally transformed retail landscapes worldwide, with global online sales projected to exceed \$6.8 trillion by 2028 (Miglani, 2024). This digital revolution has elevated last-mile delivery from a peripheral logistics function to a critical strategic differentiator that directly shapes customer experience and loyalty. The last-mile delivery segment, representing the final step in the fulfillment process where products reach customers' doorsteps, accounts for up to 53% of total shipping costs and significantly influences brand perception (Closing the Logistics Loop with Last-Mile Delivery, n.d.).

In today's hypercompetitive e-commerce environment, where switching costs are minimal and alternatives are readily accessible, customer loyalty has become increasingly elusive yet essential for sustainable business success. Research indicates that acquiring new customers costs five to seven times more than retaining existing ones, while a 5% increase in customer retention can boost profits by 25-95% (Noor et al., 2024). Consequently, understanding the mechanisms through which last-mile delivery performance influences customer loyalty has become paramount for e-commerce success.

The COVID-19 pandemic has further accelerated e-commerce adoption and heightened customer expectations for delivery services. Consumers now demand faster, more reliable, and flexible delivery options, with 87% of online shoppers citing delivery experience as a key factor in their repurchase decisions (Singh, 2022). This paradigm shift has prompted retailers to reimagine their last-mile strategies, investing heavily in technologies and capabilities that enhance delivery performance.

Despite substantial industry investments and academic interest, the relationship between specific last-mile delivery attributes and customer loyalty remains inadequately understood. While previous studies have

examined various aspects of logistics service quality, most have adopted broad perspectives without isolating the distinct effects of critical delivery performance dimensions. This research addresses this gap by systematically investigating how three key last-mile delivery performance factors delivery speed, delivery accuracy, and return handling influence customer loyalty in e-commerce contexts.

Research Questions

This study seeks to answer the following research questions:

RQ1: To what extent does delivery speed influence customer loyalty in e-commerce transactions?

RQ2: How does delivery accuracy affect customer loyalty in online retail environments?

RQ3: What is the impact of return handling efficiency on e-commerce customer loyalty?

RQ4: Which last-mile delivery performance dimension has the strongest effect on customer loyalty?

Research Objectives

The primary objectives of this research are:

To empirically examine the relationship between delivery speed and customer loyalty in e-commerce settings

To investigate the impact of delivery accuracy on customer retention and repeat purchase intentions

To assess how return handling procedures influence customer loyalty behaviors

To determine the relative importance of different last-mile delivery performance dimensions in predicting customer loyalty

To provide actionable insights for e-commerce practitioners seeking to optimize their last-mile delivery strategies

Significance of the Study

This research makes several important contributions to theory and practice. Theoretically, it extends the service quality literature by decomposing last-mile delivery performance into distinct, measurable dimensions and empirically testing their differential effects on customer loyalty. The study integrates perspectives from operations management, marketing, and consumer behavior to develop a comprehensive understanding of how operational performance translates into customer retention.

From a practical standpoint, the findings offer valuable guidance for e-commerce managers and logistics service providers in resource allocation and capability development. By identifying which delivery performance dimensions most strongly influence loyalty, the study enables more targeted investments in last-mile infrastructure and processes. Furthermore, the research provides benchmarks for performance measurement and competitive positioning in rapidly evolving e-commerce markets.

The study also contributes to sustainable business practices by highlighting how efficient return handling can reduce environmental impact while enhancing customer satisfaction. This dual benefit aligns with growing consumer consciousness about sustainability and corporate social responsibility in e-commerce operations.

LITERATURE REVIEW

Last-Mile Delivery in E-Commerce

Last-mile delivery represents the final and often most complex stage of the e-commerce fulfillment process, encompassing all activities from the last distribution center to the customer's location (Lim et al., 2018). This

segment has emerged as a critical battleground for competitive advantage, with retailers recognizing that delivery experience significantly shapes overall customer satisfaction and brand perception. Recent industry data indicates that the global last-mile delivery market reached \$161.20 billion in 2024, with projections suggesting continued double-digit growth through 2030 (Last Mile Delivery Market Size, Share & Growth Report, 2030, n.d.)

The complexity of last-mile delivery stems from multiple factors, including urban congestion, delivery density variations, customer availability, and the need for real-time coordination (Alverhed et al., 2024). These challenges are compounded by rising customer expectations for faster, cheaper, and more flexible delivery options. Identified five key trends shaping last-mile delivery: same-day delivery proliferation, autonomous vehicle adoption, crowd-sourced delivery models, smart locker deployment, and sustainability initiatives. Each trend reflects attempts to balance operational efficiency with customer satisfaction while managing cost pressures (Lyons & McDonald, 2023).

The strategic importance of last-mile delivery extends beyond operational considerations to encompass brand differentiation and customer relationship management. (Pourmohammadreza et al., 2025) demonstrated that delivery experience accounts for 48% of the variance in overall e-commerce satisfaction, surpassing product quality and price as determinants of customer evaluation. This finding underscores the transformative role of last-mile delivery in shaping competitive dynamics within digital commerce ecosystems.

Customer Loyalty in Digital Commerce

Customer loyalty in e-commerce contexts exhibits distinct characteristics compared to traditional retail environments. The absence of physical interactions, reduced switching costs, and information transparency create unique challenges for building lasting customer relationships (Liu et al., 2011). E-commerce loyalty manifests through multiple behavioral and attitudinal dimensions, including repeat purchases, positive word-of-mouth, resistance to competitive offers, and willingness to pay premium prices.

Contemporary loyalty research distinguishes between transactional loyalty, driven by convenience and habit, and emotional loyalty, rooted in genuine brand attachment and identification (Hung, 2014). While transactional loyalty may generate short-term repeat purchases, emotional loyalty provides more sustainable competitive advantages through increased customer lifetime value and advocacy behaviors. The challenge for e-commerce firms lies in transcending purely transactional relationships to forge deeper emotional connections with customers.

Digital technologies have enabled sophisticated loyalty measurement and management approaches. Advanced analytics allow firms to track customer journeys, predict churn probability, and personalize retention interventions. However, (Kumar & Agrawal, 2024) caution that technological capabilities alone cannot guarantee loyalty; rather, they must be complemented by genuine value creation through superior service delivery and customer experience management.

Delivery speed has emerged as a primary competitive weapon in e-commerce, with major retailers investing billions in infrastructure and capabilities to accelerate fulfillment. The proliferation of same-day and instant delivery services reflect recognition that temporal utility represents a key value driver for online shoppers. 73% of consumers consider delivery speed when choosing between competing retailers, with younger demographics showing particularly strong preferences for rapid fulfillment (Omnichannel Retail Statistics: Current State and Future Insights, n.d.)

The psychological mechanisms underlying speed preferences involve both utilitarian and hedonic considerations. From a utilitarian perspective, faster delivery reduces waiting costs and enables immediate consumption. Hedonically, rapid fulfillment satisfies instant gratification desires and creates positive surprise when expectations are exceeded. (Baldi et al., 2024) demonstrated that delivery speed influences not only satisfaction with the logistics service but also product evaluation and overall brand perception, highlighting the spillover effects of delivery performance.

Delivery Accuracy and Service Quality

Delivery accuracy encompasses multiple dimensions, including delivering the correct items, meeting promised delivery windows, and ensuring products arrive in acceptable condition. This performance dimension directly affects service reliability perceptions and trust formation in e-commerce relationships. Studies consistently show that delivery failures, even when subsequently resolved, significantly damage customer confidence and reduce repurchase intentions (Harter et al., 2024).

The impact of delivery accuracy extends beyond individual transactions to shape long-term relationship quality. (Norouzi, 2024) found that accuracy consistency across multiple orders strongly predicts customer lifetime value, with high-accuracy performers enjoying 40% higher retention rates compared to industry averages. This finding emphasizes the cumulative nature of accuracy effects and the importance of operational excellence in building customer loyalty.

Technology adoption has dramatically improved delivery accuracy capabilities through real-time tracking, predictive analytics, and automated quality control systems. However, (Ekuma, 2023) note that technology-enabled accuracy improvements must be balanced with human touchpoints that provide flexibility and problem resolution when errors occur. The optimal approach combines systematic accuracy enhancement with responsive service recovery mechanisms that maintain customer trust despite occasional failures.

Hypothesis Development

Drawing on service quality theory and the expectancy-disconfirmation paradigm, this study proposes that last-mile delivery performance dimensions influence customer loyalty through their effects on service evaluation and satisfaction. When delivery performance meets or exceeds expectations, positive disconfirmation generates satisfaction and strengthens loyalty intentions. Conversely, performance failures create negative disconfirmation that erodes trust and increases defection probability.

Based on the literature review, we propose the following hypotheses:

H1: Delivery speed positively influences customer loyalty in e-commerce transactions.

H2: Delivery accuracy positively influences customer loyalty in e-commerce transactions.

H3: Return handling efficiency positively influences customer loyalty in e-commerce transactions.

H4: Among the three delivery performance dimensions, delivery accuracy has the strongest effect on customer loyalty.

METHODOLOGY

This study employs a quantitative research design using cross-sectional survey methodology to examine the relationships between last-mile delivery performance dimensions and customer loyalty. The quantitative approach enables systematic hypothesis testing and generalization of findings across the e-commerce population. Cross-sectional data collection provides efficiency while capturing current market dynamics and customer perceptions.

The target population comprises adult consumers (aged 18 and above) who have completed at least three e-commerce purchases within the past six months. This criterion ensures participants possess sufficient experience to evaluate delivery performance meaningfully. The sampling frame includes consumers from diverse demographic backgrounds, product categories, and geographic locations to enhance external validity.

Sample size determination followed established guidelines for multiple regression analysis. With three independent variables and assuming a medium effect size ($f^2 = 0.15$), power analysis indicated a minimum sample of 119 participants for 0.95 statistical power at $\alpha = 0.05$. To account for potential data quality issues

and enhance precision, we targeted 400 responses. After data screening, 386 valid responses were retained for analysis, exceeding recommended thresholds for robust statistical inference.

Participants were recruited through a professional online panel provider using stratified random sampling to ensure demographic representativeness. Stratification variables included age, gender, income, and geographic region, with quotas established based on national e-commerce user statistics.

All constructs were measured using established scales adapted from prior research and modified for the e-commerce context. Seven-point Likert scales (1 = strongly disagree, 5 = strongly agree) were employed for all items to provide sufficient variance and discrimination between response categories.

Data collection occurred over a four-week period using an online survey platform. Participants received an email invitation explaining the research purpose, voluntary participation, and confidentiality assurances. The survey began with screening questions to verify eligibility, followed by the main questionnaire sections. To minimize order effects, question blocks were randomized across participants.

Several measures enhanced data quality. Attention check questions identified careless responding, reverse-coded items detected response patterns, and completion time screening removed surveys completed unreasonably quickly. IP address verification prevented duplicate responses, while incomplete surveys were excluded from analysis.

Data analysis proceeded through multiple stages using SPSS 30 statistical software. Preliminary analyses included data screening, missing value assessment, and assumption testing for multiple regression. Descriptive statistics characterized the sample and variables, while reliability analysis confirmed scale internal consistency.

Correlation analysis examined bivariate relationships between variables and identified potential multicollinearity issues. Multiple regression analysis tested the research hypotheses, with customer loyalty as the dependent variable and delivery performance dimensions as independent variables. Hierarchical regression enabled assessment of incremental variance explained by each predictor.

Additional analyses included mediation testing to explore indirect effects through customer satisfaction, moderation analysis examining demographic influences, and robustness checks using alternative estimation methods. These supplementary analyses strengthen confidence in the findings and provide deeper insights into the studied relationships.

This research adhered to established ethical guidelines for human subjects research. Institutional Review Board approval was obtained prior to data collection. All participants provided informed consent after receiving comprehensive information about the study purpose, procedures, and rights. Participation was voluntary with the option to withdraw at any point without consequence.

Data confidentiality was maintained through anonymous survey design and secure data storage. Personal identifiers were not collected, and responses were aggregated for analysis. Findings are reported at the aggregate level without possibility of individual identification. These ethical safeguards ensure participant protection while maintaining scientific rigor.

RESULTS AND DISCUSSION

Sample Characteristics

The final sample of 386 participants exhibited diverse demographic characteristics representative of the e-commerce consumer population. Gender distribution was balanced with 52.3% female and 47.7% male participants. Age ranged from 18 to 67 years ($M = 36.4$, $SD = 11.8$), with the largest cohort being 25-34 years (31.6%), followed by 35-44 years (27.2%), 45-54 years (19.4%), 18-24 years (13.5%), and 55+ years (8.3%).

Table 1: Demographic information

Characteristic	Value
Gender	
Female	52.3%
Male	47.7%
Age	
18–24	13.5%
25–34	31.6%
35–44	27.2%
45–54	19.4%
55+	8.3%
Education	
Bachelor's degree or higher	68.4%
Below Bachelor's	31.6%
Annual Household Income	
< 40,000	24.1%
40,000–70,000	35.2%
70,000–100,000	26.9%
>100,000	13.8%
E-commerce Experience	M = 7.3 years, SD = 3.2
Purchases per Month	M = 4.6, SD = 2.8
Frequently Purchased Categories	
Clothing/Accessories	78.2%
Electronics	64.5%
Books/Media	59.3%
Home Goods	52.8%
Groceries	41.7%

Educational attainment was relatively high, with 68.4% holding bachelor's degrees or higher, reflecting the digital literacy requirements for e-commerce participation. Annual household income showed wide variation,

with 24.1% reporting less than 40,000, 35.2% between 40,000-70,000, 26.9% between 70,000-100,000, and 13.8% exceeding 100,000.

Participants reported substantial e-commerce experience, averaging 7.3 years of online shopping ($SD = 3.2$) and 4.6 purchases per month ($SD = 2.8$). Product categories purchased most frequently included clothing/accessories (78.2%), electronics (64.5%), books/media (59.3%), home goods (52.8%), and groceries (41.7%). This diversity ensures findings generalize across various e-commerce segments.

Descriptive Statistics

Table 2 presents descriptive statistics for all study variables, including means, standard deviations, and scale reliabilities.

Table 2 Descriptive Statistics and Scale Reliabilities

Variable	Mean	SD	Cronbach's α	Skewness	Kurtosis
Delivery Speed	5.23	1.14	0.87	-0.42	0.18
Delivery Accuracy	5.67	1.03	0.91	-0.58	0.31
Return Handling	4.92	1.31	0.89	-0.34	-0.22
Customer Loyalty	5.31	1.21	0.93	-0.51	0.27

All scales demonstrated satisfactory internal consistency with Cronbach's alpha values exceeding the 0.70 threshold recommended for established scales. Customer loyalty showed the highest reliability ($\alpha = 0.93$), followed by delivery accuracy ($\alpha = 0.91$), return handling ($\alpha = 0.89$), and delivery speed ($\alpha = 0.87$).

Mean scores indicate generally positive evaluations across all dimensions, with delivery accuracy receiving the highest ratings ($M = 5.67$) and return handling the lowest ($M = 4.92$). The relatively high standard deviations suggest meaningful variation in customer experiences and perceptions across the sample.

Normality assessment through skewness and kurtosis values indicated approximate normal distributions for all variables, with values falling within the acceptable range of -2 to +2. This supports the appropriateness of parametric statistical techniques for hypothesis testing.

Correlation Analysis

Table 3 displays the correlation matrix examining relationships between study variables.

Table 3. Correlation Matrix

Variable	1	2	3	4
1. Delivery Speed	1.00			
2. Delivery Accuracy	0.52***	1.00		
3. Return Handling	0.44***	0.48***	1.00	
4. Customer Loyalty	0.58***	0.71***	0.62***	1.00

*** $p < 0.001$

All variables showed significant positive correlations, supporting the hypothesized relationships. Customer loyalty demonstrated strong correlations with all three delivery performance dimensions, with delivery accuracy showing the strongest bivariate relationship ($r = 0.71$, $p < 0.001$), followed by return handling ($r = 0.62$, $p < 0.001$) and delivery speed ($r = 0.58$, $p < 0.001$).

Correlations among independent variables ranged from 0.44 to 0.52, indicating moderate relationships that warrant attention for multicollinearity but fall below concerning thresholds. Variance inflation factor (VIF) values in subsequent regression analyses ranged from 1.42 to 1.58, well below the conservative cutoff of 5.0, confirming absence of problematic multicollinearity.

Hypothesis Testing

Multiple regression analysis was conducted to test the research hypotheses. Table 4 presents the regression results with customer loyalty as the dependent variable.

Table 4. Multiple Regression Analysis Results

Variable	B	SE	β	t	p	VIF
Constant	0.847	0.238	-	3.56	<0.001	-
Delivery Speed	0.262	0.047	0.247	5.57	<0.001	1.42
Delivery Accuracy	0.484	0.054	0.412	8.96	<0.001	1.51
Return Handling	0.275	0.041	0.298	6.71	<0.001	1.58

$R^2 = 0.672$, Adjusted $R^2 = 0.669$, $F(3, 382) = 261.23$, $p < 0.001$

The regression model explained 67.2% of the variance in customer loyalty ($R^2 = 0.672$, $F(3, 382) = 261.23$, $p < 0.001$), indicating strong predictive power. All three delivery performance dimensions significantly predicted customer loyalty, supporting hypotheses H1, H2, and H3.

Hypothesis 1 proposed that delivery speed positively influences customer loyalty. The results support this hypothesis ($\beta = 0.247$, $t = 5.57$, $p < 0.001$), indicating that faster delivery significantly enhances customer loyalty. Each unit increase in perceived delivery speed is associated with a 0.262 unit increase in loyalty, holding other factors constant.

Hypothesis 2 suggested that delivery accuracy positively influences customer loyalty. This hypothesis received strong support ($\beta = 0.412$, $t = 8.96$, $p < 0.001$), with delivery accuracy emerging as the strongest predictor. The standardized coefficient indicates that a one standard deviation increase in delivery accuracy corresponds to a 0.412 standard deviation increase in loyalty.

Hypothesis 3 posited that return handling efficiency positively influences customer loyalty. The results confirm this hypothesis ($\beta = 0.298$, $t = 6.71$, $p < 0.001$), demonstrating that effective return processes significantly contribute to customer retention. The magnitude of this effect exceeded that of delivery speed, highlighting the importance of post-purchase service quality.

Hypothesis 4 predicted that delivery accuracy would have the strongest effect on customer loyalty among the three dimensions. The standardized coefficients support this hypothesis, with delivery accuracy ($\beta = 0.412$) showing a larger effect than return handling ($\beta = 0.298$) or delivery speed ($\beta = 0.247$). Pairwise comparisons using Wald tests confirmed that the difference between delivery accuracy and other predictors was statistically significant ($p < 0.05$).

Additional Analyses

To provide deeper insights, several supplementary analyses were conducted. First, mediation analysis examined whether customer satisfaction mediates the relationship between delivery performance and loyalty. Results indicated significant partial mediation effects for all three predictors, with satisfaction accounting for 38-45% of the total effects. This finding aligns with service quality theory suggesting that operational performance influences loyalty through satisfaction mechanisms.

Second, moderation analysis explored whether demographic factors influence the strength of relationships. Age significantly moderated the effect of delivery speed ($\beta = -0.087$, $p = 0.018$), with younger consumers showing stronger loyalty responses to speed improvements. Income moderated the return handling effect ($\beta = 0.094$, $p = 0.023$), suggesting that higher-income consumers place greater value on convenient return processes.

Third, polynomial regression tested for nonlinear relationships. A significant quadratic term for delivery speed ($\beta = -0.073$, $p = 0.041$) indicated diminishing returns at high-speed levels, consistent with satisfaction plateau effects identified in prior research. Linear relationships adequately characterized the accuracy and return handling effects.

DISCUSSION OF FINDINGS

The results provide compelling evidence that last-mile delivery performance significantly influences customer loyalty in e-commerce contexts. The substantial variance explained (67.2%) demonstrates that delivery performance represents a primary driver of customer retention, validating industry investments in logistics capabilities. These findings extend service quality literature by decomposing delivery performance into distinct dimensions and quantifying their differential impacts on loyalty.

The preeminence of delivery accuracy as a loyalty predictor aligns with reliability being a foundational service quality dimension. Customers appear to prioritize consistent, error-free delivery over speed, suggesting that reliability concerns dominate evaluation processes. This finding has important implications for resource allocation, indicating that investments in accuracy-enhancing technologies and processes may yield superior returns compared to speed-focused initiatives.

The significant effect of return handling challenges traditional conceptualizations of delivery as a unidirectional process. Contemporary e-commerce requires bidirectional logistics capabilities that support the complete customer journey. The strength of this relationship ($\beta = 0.298$) suggests that return experience substantially influences overall service evaluation and loyalty formation. This finding is particularly relevant given rising return rates and growing consumer expectations for hassle-free return processes.

While delivery speed showed the smallest standardized coefficient among the three predictors, its effect remained substantial and statistically significant. The identified nonlinear relationship suggests an optimal speed range beyond which marginal improvements provide minimal loyalty benefits. This finding challenges the prevalent "faster is always better" mentality and advocates for strategic speed positioning that balances customer value with operational costs.

The mediation analysis revealing partial effects through satisfaction confirms that delivery performance influences loyalty through both direct and indirect pathways. Direct effects may reflect the signaling value of delivery performance in communicating retailer competence and customer orientation. Indirect effects through satisfaction align with traditional service quality frameworks linking operational performance to customer outcomes through evaluation processes.

Moderation effects highlight the importance of customer segmentation in delivery strategy formulation. Younger consumers' heightened sensitivity to delivery speed reflects generational differences in instant gratification expectations and time valuation. Higher-income consumers' emphasis on return handling may stem from higher opportunity costs and greater purchase risk exposure. These findings suggest that one-size-

fits-all delivery strategies may be suboptimal, with targeted approaches needed for different customer segments.

CONCLUSION

Theoretical Contributions

This research makes several significant contributions to the e-commerce and service operations literature. First, it provides empirical evidence for the multidimensional nature of last-mile delivery performance and its differential effects on customer loyalty. By decomposing delivery performance into speed, accuracy, and return handling components, the study offers a more nuanced understanding of how operational capabilities translate into customer retention.

Second, the research extends service quality theory to the e-commerce context by identifying delivery accuracy as the dominant driver of loyalty. These finding challenges speed-centric perspectives prevalent in industry discourse and academic research, suggesting that reliability considerations outweigh temporal factors in customer evaluation processes. The theoretical implication is that service quality hierarchies may differ in digital versus physical retail environments.

Third, the study contributes to reverse logistics literature by establishing return handling as a critical loyalty antecedent comparable in importance to forward delivery performance. This finding elevates returns from operational necessity to strategic opportunity, suggesting that competitive advantage can be achieved through superior reverse logistics capabilities.

Practical Implications

The findings offer actionable guidance for e-commerce practitioners and logistics service providers. The primacy of delivery accuracy suggests that firms should prioritize investments in quality control systems, inventory management, and order fulfillment accuracy over pure speed improvements. Technologies such as automated picking systems, RFID tracking, and AI-powered quality checks can enhance accuracy while maintaining operational efficiency.

The strong effect of return handling indicates that firms should view returns as relationship-building opportunities rather than cost centers. Implementing customer-friendly return policies, offering multiple return channels, and ensuring rapid refund processing can significantly enhance loyalty. The business case for liberal return policies is strengthened by evidence that return experience substantially influences retention.

The nonlinear relationship between speed and loyalty suggests that firms should identify optimal speed thresholds rather than pursuing maximum velocity. Cost-benefit analysis should consider diminishing loyalty returns when evaluating investments in expedited delivery infrastructure. Strategic speed positioning that meets customer expectations without overdelivering may optimize profitability.

Customer segmentation based on delivery preference heterogeneity can enhance targeting effectiveness. Younger, time-sensitive segments may justify premium speed options, while quality-conscious segments may respond better to reliability guarantees. Personalized delivery options that allow customers to self-select based on individual preferences can maximize satisfaction across diverse segments.

Limitations and Future Research

Several limitations should be acknowledged when interpreting the findings. First, the cross-sectional design precludes causal inference, and longitudinal research is needed to establish temporal relationships between delivery performance and loyalty evolution. Future studies could employ panel data or experimental designs to strengthen causal claims.

Second, the study focused on three delivery performance dimensions, but other factors such as delivery flexibility, communication quality, and sustainability may also influence loyalty. Comprehensive frameworks

incorporating additional dimensions could provide more complete understanding of delivery performance effects.

Third, the research did not account for contextual factors such as product category, purchase value, or competitive intensity that may moderate observed relationships. Future research should examine boundary conditions and contingency factors that influence the delivery performance-loyalty relationship.

Fourth, cultural factors may influence delivery expectations and loyalty formation processes. The study's single-country focus limits generalizability, and cross-cultural research is needed to identify universal versus culture-specific effects.

Future research directions include investigating the role of emerging technologies such as autonomous delivery vehicles, drone delivery, and predictive logistics in shaping customer expectations and loyalty. The integration of sustainability considerations into delivery performance frameworks represents another promising avenue, particularly given growing environmental consciousness among consumers.

Concluding Remarks

This study demonstrates that last-mile delivery performance profoundly influences customer loyalty in e-commerce environments. The findings reveal that delivery accuracy serves as the strongest loyalty predictor, followed by return handling and delivery speed. These insights challenge prevailing assumptions about the primacy of speed and highlight the multifaceted nature of delivery performance evaluation.

As e-commerce continues its rapid expansion and evolution, understanding the mechanisms linking operational performance to customer outcomes becomes increasingly critical. The evidence presented here suggests that sustainable competitive advantage lies not in singular focus on speed but in balanced excellence across multiple delivery performance dimensions. Firms that recognize and act upon these insights will be better positioned to build lasting customer relationships in the digital economy.

The research underscores that last-mile delivery has transcended its traditional role as a back-office function to become a frontline customer experience differentiator. In an era where product and price advantages are easily replicated, superior delivery performance may represent the last frontier for competitive differentiation. The companies that master the last mile will ultimately win the race for customer loyalty in the digital marketplace.

Ethical Approval

The study was conducted in accordance with the ethical principles of voluntary participation, informed consent, and data protection. Participants were informed about the study's purpose and procedures, and their participation was considered as implied consent.

Conflict Of Interest

The authors declare that they have no conflicts of interest.

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