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Logistics Service and Its Impact on Shaping Customer Satisfaction and Loyalty in E-Commerce Distribution: An Empirical Research from Vietnam

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Abstract

Purpose: This study aims to analyze how six logistics service quality components impact customer satisfaction and loyalty in the context of e-commerce distribution in Vietnam. It focuses on exploring how these elements, including customer service, delivery service, reverse logistics, product quality, product availability, and information quality influence customer satisfaction and loyalty. **Research Design and Methodology:** A mixed-methods approach was adopted, combining qualitative interviews with a quantitative survey conducted between January and May 2025. Using non-probability sampling, 327 valid responses were collected from online customers. Structural Equation Modeling (SEM) was used to analyze the relationships between the six aforementioned elements, customer satisfaction, and loyalty**. Results:** The findings show that five components - customer service, delivery service, reverse logistics, product quality, and product availability - positively influence customer satisfaction. Among them, product availability shows the strongest effect, whereas information quality has no significant impact. The results also confirm that higher customer satisfaction leads to greater customer loyalty. **Conclusions:** This study contributes to the understanding of logistics service impacts in digital marketplaces. It offers practical implications for e-commerce firms and policymakers aiming to enhance service performance, improve customer satisfaction, and foster long-term customer loyalty in competitive online environments.

Keywords: Customer Loyalty, Customer Satisfaction, Distribution Science, E-Commerce, Logistics Service.

JEL Classification Code: L81, L87, M16, M21, D91

1. Introduction

The global business landscape has witnessed significant transformation due to the rapid rise of e-commerce, in which logistics has emerged as a critical determinant of customer experience and a source of competitive advantage for firms. According to the "e-Conomy SEA 2024" report by Google, Temasek, and Bain and Company (2024), the Vietnamese e-commerce sector has been experiencing impressive growth, reaching a gross merchandise value (GMV) of USD 22 billion in 2024. This figure positions Vietnam as the third-largest e-commerce market in Southeast Asia, following Indonesia and Thailand among the region's top six economies. This surge has turned logistics into a strategic priority for online retailers, who increasingly rely on high-quality logistics services to enhance customer satisfaction

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and build loyalty.

Unlike traditional retail, e-commerce demands a highly integrated, technology-driven logistics system capable of fulfilling diverse consumer needs, ensuring fast delivery cycles, and handling returns efficiently. This includes innovations such as real-time parcel tracking and AI-driven customer support (Asawawibul et al., 2025). Logistics has evolved from a mere backend function within this context into a core element of perceived customer value. Several studies have underscored the pivotal role of logistics service quality (LSQ) in shaping customer satisfaction, retention, and repurchase intentions (Minh et al., 2024; Sann et al., 2024). This is particularly vital in emerging markets like Vietnam, where infrastructural disparities, traffic congestion, and fragmented logistics services are still prevalent. Ensuring reliable and high-quality logistics thus becomes crucial in sustaining customer satisfaction in such settings (Ok & Hongsik, 2020).

Despite its growing significance, empirical research exploring the relationship between logistics service quality and customer satisfaction in Vietnam's e-commerce sector remains limited. Tam (2020) revealed that most existing research only focuses on isolated logistics components such as delivery speed or cost, lacking a comprehensive approach to LSQ dimensions or the mediating role of technology in shaping customer experiences. Furthermore, studies on e-commerce logistics often concentrate on traditional or port-related logistics contexts (Le et al., 2020; Vo et al., 2025), leaving a gap in addressing the e-commerce environment specifically.

This study addresses these gaps by adopting a more comprehensive approach to logistics service quality (LSQ), examining six key factors, including the often-overlooked factor of Information Quality (IQ), which is particularly relevant in digital commerce. Unlike prior research that tends to focus narrowly on operational aspects such as delivery speed or cost, this study broadens the scope by incorporating both traditional logistics factors and informational elements, and by targeting a Gen Z-majority respondent group - a digitally native segment that dominates online shopping in Vietnam. The findings not only reaffirm the critical roles of Delivery Service and Product Availability in shaping customer satisfaction, but also uncover a noteworthy insight: Information Quality does not significantly impact satisfaction, contrary to earlier research results. This divergence highlights the evolving expectations of younger consumers in the digital age. The study thus makes both theoretical and practical contributions by advancing the LSQ framework for e-commerce contexts and offering actionable strategies for firms aiming to enhance customer experience and loyalty among new-generation online shoppers.

2. Theoretical Basis and Research Hypothesis

2.1. Logistics Service

E-commerce logistics services are defined as a set of coordinated activities aimed at efficiently delivering products from suppliers to end customers. These include warehousing, order processing, transportation, delivery, and return management (Kayikci, 2019; Zennaro et al., 2022). This complex system requires seamless coordination across multiple nodes in the supply chain to meet customer expectations regarding speed, accuracy, and flexibility (Mentzer et al., 2001; Uvet, 2020). According to Bienstock et al. (2008), logistics services encompass tangible transportation functions and intangible service components that demand high levels of information quality, responsiveness, and reliability.

Given that online shoppers cannot physically inspect or handle products prior to purchase, logistics service quality becomes a critical determinant of the overall shopping experience (Do et al., 2023; Hui et al., 2025). A well-executed logistics system ensures that customers receive "the right product, in the right quantity, at the right place, at the right time, in the right condition, at the right price, and with the right information," as promised (Akıl & Ungan, 2022). The key dimensions of logistics service quality align with the SERVQUAL framework and include reliability, responsiveness, assurance, empathy, and tangibles - adapted to the logistics context (Parasuraman et al., 1988; Le et al., 2020).

Conversely, any disruption in the logistics process - ranging from stockouts and delayed deliveries to lack of transparency or difficulties in returns - can lead to a negative customer experience, significantly diminishing satisfaction and even repurchase intentions (Rashid & Rasheed, 2024; Sumrit & Sowijit, 2023). Therefore, in the digital commerce environment, logistics services not only function as an operational backbone but also play a strategic role in generating perceived value and fostering customer loyalty.

2.2. Theoretical Framework

The SERVQUAL model is a framework for measuring service quality through five key dimensions: reliability, assurance, tangibles, empathy, and responsiveness (Parasuraman et al., 1988). In the context of e-commerce, this model has been adapted to assess logistics service quality, emphasizing the ability to meet customer expectations regarding delivery speed, accuracy, and staff attitude. Mian et al. (2023) applied a combined SERVQUAL-LSQ approach to evaluate logistics service quality in small towns, finding that responsiveness and reliability were the most influential factors affecting

customer satisfaction. In Vietnam, Phan and Huynh (2023) employed this model to analyze logistics services in the fresh food sector, demonstrating that "service capability" - such as fast order processing - had a significant impact on customer satisfaction.

The Logistics Service Quality (LSQ) model focuses on nine dimensions, including delivery timeliness, information quality, complaint handling, and product condition (Mentzer et al., 2001). This model emphasizes the role of logistics as a competitive tool through the optimization of customer experience. Rashid and Rasheed (2024) identified six LSQ dimensions specific to cross-border e-commerce, with price fairness and communication quality being the most influential factors on customer satisfaction. In Vietnam, Nguyen and Pham (2024) applied the LSQ model to assess the challenges of cross-border logistics and found that "complaint handling" was the weakest dimension due to workforce limitations.

Expectation Confirmation Theory (ECT) explains customer satisfaction by comparing pre-purchase expectations with actual service performance. When logistics services meet or exceed expectations, customers are more likely to remain loyal. Lu & Liao (2023) applied ECT to the e-commerce context and found that customers canceled their orders when delivery times exceeded the promised timeframe. In Indonesia, Monoarfa et al. (2024) examined fresh food e-commerce and integrated ECT with the Technology Acceptance Model (TAM), discovering that electronic logistics service quality (E-LSQ) served as a mediating factor between expectations and repurchase intention. Akıl and Ungan (2024) also incorporated ECT into their evaluation of logistics quality, identifying "quick complaint resolution" as a key factor in confirming expectations. In Vietnam, a survey by Phan & Huynh (2023) revealed that the majority of Generation Z customers abandoned their shopping carts when logistics information was unclear, highlighting a misalignment between expectations and actual service performance.

2.3. Research Hypothesis

2.3.1. Relationship Between Customer Service and Customer Satisfaction

Customer service encompasses the activities provided by businesses to assist customers before, during, and after a purchase, facilitating a complete, convenient, and satisfactory experience. Xie et al. (2020) found that AI-powered automatic response systems reduce waiting times and improve complaint-handling accuracy in e-commerce settings. Omnichannel models that integrate chatbots, hotlines, and video calls have been shown to yield higher satisfaction ratings compared to single-channel systems (Gajewska & Zimon, 2018). Similarly, Huang and Rust (2018) demonstrated that predictive analytics for support demand can lower the incidence of repeated complaints. Studies by Stockdale and Standing (2006) and Cheng et al. (2019) further revealed that employee empathy positively correlates with satisfaction during service crises.

H1: Customer Service (CS) has a positive impact on customer satisfaction in e-commerce platforms

2.3.2. Relationship Between Delivery Service and Customer Satisfaction

Delivery service refers to the process of transporting goods or services from organizations or individuals to end consumers. Zhou and Lin (2019) developed a multimodal delivery model incorporating drones and electric vehicles, which significantly reduced average delivery times and improved customer satisfaction scores. Le et al. (2019), in a study of 15 major cities, found that offering timely and flexible delivery services increased customer satisfaction compared to standard delivery. Product preservation during transportation also positively influences satisfaction by minimizing product damage (Choi et al., 2021). Moreover, the application of blockchain technology in delivery traceability has enhanced trust in the transparency of the logistics process (Zhou et al., 2021).

H2: Delivery Service (DS) has a positive impact on customer satisfaction in e-commerce platforms.

2.3.3. Relationship Between Reverse Logistics and Customer Satisfaction

Reverse logistics is defined as the planning, implementation, and control of the flow of raw materials, work-in-progress, finished goods, or information from the point of consumption back to the origin for return, recovery, or disposal purposes. AI-driven automated return systems have been shown to shorten processing times and increase satisfaction levels (Dabees et al., 2023). Kianpour et al. (2017) found that a 24-hour refund policy leads to a higher repurchase intention than a 7-day return policy. The closed-loop recycling model not only reduces waste but also strengthens green brand perception, especially among younger consumers (Tran, 2024). Panjehfouladgaran and Shirouyehzad (2018) showed that applying IoT in returned goods management reduces the risk of unsellable inventory.

H3: Reverse Logistics (RL) has a positive impact on customer satisfaction in e-commerce platforms.

2.3.4. Relationship Between Product Quality and Customer Satisfaction

Product quality extends beyond physical attributes to include symbolic and emotional value. Das Guru and Paulssen (2020) found that ISO-certified products resulted in significantly higher satisfaction levels than uncertified

alternatives. Environmentally friendly raw materials were positively associated with satisfaction in a study by Kianpour et al. (2017). The spillover effect of electronic product quality, particularly ecosystem compatibility, was shown to enhance the perceived value of complementary products (Kenyon & Sen, 2015). Jie and Karia (2024) quantitatively confirmed that a three-dimensional model of product value - economic, aesthetic, and hedonic - positively affects customer satisfaction.

H4: Product Quality (PQ) has a positive impact on customer satisfaction in e-commerce platforms.

2.3.5. Relationship Between Product Availability and Customer Satisfaction

Product availability refers to the readiness of goods or services for purchase when consumers are willing to buy. Real-time demand forecasting algorithms have proven effective in reducing stockouts and improving inventory accuracy (Kok et al., 2015). Additionally, Pan et al. (2020), in a study of 50 e-commerce platforms, found that multichannel stock visibility systems led to higher conversion rates. Vu et al. (2020) argued that multi-supplier integration increases product availability and correlates with higher satisfaction scores. The application of RFID technology for real-time inventory updates has also been shown to reduce phantom ordering errors (Hehua, 2021).

H5: Product Availability (PA) has a positive impact on customer satisfaction in e-commerce platforms.

2.3.6. Relationship Between Information Quality and Customer Satisfaction

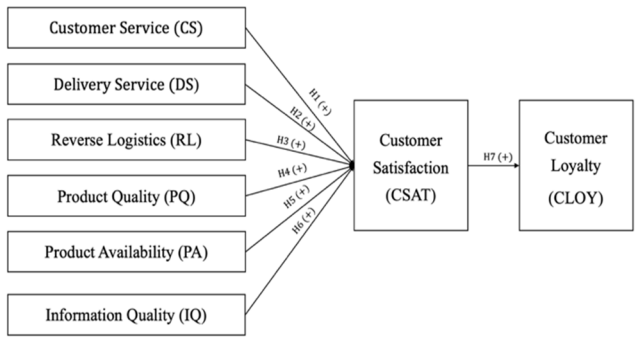
Information quality - defined as the accuracy, reliability, and relevance of product or service data - plays a vital role in shaping customer perception. Vu et al. (2020) and Vasić et al. (2021) demonstrated that accurate information increases trust and purchase intention by reducing perceived risks. When product information includes full specifications, quality certifications, and warranty policies, customers tend to rate a business as more transparent (Huang & Benyoucef, 2013; Pramudita & Guslan, 2025). Intelligent recommendation systems that personalize content based on historical purchase data have been shown to increase website interaction time (Ihsan et al., 2020). Gao and Su (2017) found that real-time inventory updates help reduce order cancellations due to stockouts. Liu et al. (2023) developed and validated an information quality scale for e-commerce platforms consisting of four dimensions, such as content validity, information scope, presentation quality, and enjoyment quality, that positively influence consumer behavior on e-commerce platforms.

H6: Information Quality (IQ) has a positive impact on customer satisfaction in e-commerce platforms.

2.3.7. Relationship Between Customer Satisfaction and Customer Loyalty

Oliver (1999) used ECT to assert that customer satisfaction is an important antecedent to customer loyalty when actual experiences meet or exceed initial expectations. In e-commerce logistics, on-time delivery, efficient complaint handling, and transparent information reinforce trust, thereby promoting loyal behavior. Fornell et al. (1996) pointed out the causal relationship between service quality leading to customer satisfaction, and a positive impact on customer loyalty. In Vietnam, Nguyen et al. (2025) and Nguyen (2016) declared that customer loyalty is strongly explained by customer satisfaction. Mentzer et al. (2001) confirmed that logistics service quality (LSQ) directly affects satisfaction, thereby indirectly affecting loyalty.

H7: Customer Satisfaction (CSAT) has a positive impact on Customer loyalty in e-commerce platforms.



Source: The authors analyzed

Figure 1: Proposed Research Model

3. Research Methods

This study was conducted among online customers on e-commerce platforms in Vietnam by combining both qualitative and quantitative research methods. The research process began with the collection and synthesis of data from various sources, including reference books, academic journals, and industry publications. Based on prior studies, a questionnaire was developed using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) to measure participants' levels of agreement. The proposed research model consists of 8 latent variables: (1) Customer Service (CS); (2) Delivery Service (DS); (3) Reverse Logistics (RL); (4) Product Quality (PQ); (5) Product Availability; (6) Information Quality (IQ); (7) Customer Satisfaction (CSAT); and (8) Customer Loyalty (CL).

Drawing from previous literature, the authors constructed 30 observed variables and adapted the wording of items to suit the Vietnamese context. Based on prior

methodological recommendations, the study proposed a minimum sample size of 200 to be appropriate for structural equation modeling (SEM). According to Hair et al. (2019), for models of moderate complexity, the recommended sample size should fall within the range of 5–10 observations per estimated parameter. With 30 observed variables, the suitable sample size ranges from 150 to 300 observations. Kline (2016) suggests that samples over 200 are considered large for SEM studies, though complex models with non-normal data may require larger samples. Based on these recommendations, this study aimed to collect 300 valid responses, which meets the "good" threshold defined by Chomeya et al. (2024): 50 = very poor, 100 = poor, 200 = fair, 300 = good, 500 = very good, and 1,000 = excellent.

Following the development of the initial questionnaire, qualitative research was carried out through 10 in-depth interviews with e-commerce customers and 5 logistics experts to refine wording, eliminate spelling and grammar issues, and ensure clarity and readability. A pilot quantitative study was then conducted with 30 participants to assess the feasibility of the research design, identify issues with the questionnaire, evaluate respondent attentiveness, and obtain preliminary estimates of parameters such as variance and standard deviation. The questionnaire was revised based on feedback from e-commerce customers and logistics experts.

The formal quantitative phase was administered via Google Forms, with the survey distributed directly to online shoppers who had used e-commerce platforms. To be eligible, participants were required to meet the following criteria: (1) have made a purchase through an e-commerce platform within the past three months; (2) have received the product through the platform's delivery service; and (3) have had experience with the customer service function of the platform.

The study collected a total of 370 responses, of which 327 were retained for analysis, and 43 were excluded due to missing data or failure to meet the screening criteria. The data analysis process followed four main steps: (1) Reliability testing using Cronbach's Alpha (> 0.70), as recommended by Hair et al. (2019); (2) Exploratory Factor Analysis (EFA) to assess convergent and discriminant validity; (3) Confirmatory Factor Analysis (CFA) to validate the measurement model; and (4) Structural Equation Modeling (CB-SEM) using AMOS to test the relationships between logistics service dimensions and customer satisfaction. Model fit was assessed using several indices, including CFI > 0.95, TLI > 0.90, and RMSEA < 0.08, in accordance with the benchmarks provided by Hair et al. (2014). The Maximum Likelihood (ML) estimation method was employed, which is consistent with Kline's (2016) recommendation for SEM in social science research.

Table 1: Descriptive Statistics of the Survey Sample

Criteria	Group/Option	Percentage (%)
Gender	Male	46.8
	Female	53.2
Age	18-25	42.5
	26-35	36.1
	36-45	15.3
	Above 45	6.1
Shopping frequency	Less than once per month	18.3
	1-3 times per month	41.9
	4-6 times per month	28.7
	More than 6 times per month	11.1
E-commerce platforms used (Multiple answers are possible)	Shopee	78.6
	Lazada	56.3
	Tiki	47.1
	TikTok Shop	32.4
Monthly spending	<500.000 VNĐ	28.7
	500.000-1.000.000 VNĐ	35.2
	1.000.000-2.000.000 VNĐ	24.5
	>2.000.000 VNĐ	11.6
Types of products purchased (Multiple answers are possible)	Fashion & accessories	72.5
	Cosmetics & personal care	54.1
	Electronics	49.2
	Food	31.8
	Others	56.6
Total valid responses		327

Source: Author's calculation

4. Findings

4.1. Quantitative Research Results

4.1.1. Reliability Test Results Using Cronbach's Alpha

The study conducted a reliability assessment of the measurement scales using Cronbach's Alpha coefficient for 30 observed variables across 8 latent constructs: Customer Service (CS), Delivery Service (DS), Reverse Logistics (RL), Product Quality (PQ), Product Availability (PA), Information Quality (IQ), Customer Satisfaction (CSAT), and Customer Loyalty (CLOY).

Table 2: Reliability Test Results Using Cronbach's Alpha

Scale	Number of observed variables	Cronbach's Alpha
Customer Service (CS)	5	0.853
Delivery Service (DS)	5	0.856
Reserve Logistics (RL)	4	0.838
Product Quality (PQ)	3	0.807
Product Availability (PA)	3	0.810
Information Quality (IQ)	2	0.785
Customer Satisfaction (CSAT)	5	0.818
Customer Loyalty (CLOY)	3	0.733

Source: Author's calculation

The analysis results indicate that all measurement scales exhibit good reliability, with Cronbach's Alpha coefficients exceeding the threshold of 0.7, as recommended by Hair et al. (2019). The item-total correlation coefficients for all observed variables were above 0.5, ranging from 0.517 to 0.755, suggesting a strong correlation between each item and its respective scale construct (Hair et al., 2019).

The reliability assessment confirms that all scales meet the required reliability standards and are suitable for subsequent analyses. This demonstrates that the questionnaire was carefully designed and internally consistent, and that respondents clearly understood and consistently answered the questions.

4.1.2. Exploratory Factor Analysis (EFA) Results

Following the reliability test, the study proceeded with Exploratory Factor Analysis (EFA) to assess the convergent and discriminant validity of the measurement scales. EFA was conducted separately for the independent and dependent variables. For the independent variables, the Principal Axis Factoring extraction method was applied with Promax rotation, given the potential correlations among factors.

The initial EFA results indicated that the observed variable CS1 did not load on any factor, while DS3 exhibited cross-loading on two factors. To ensure data accuracy for subsequent analyses, both CS1 and DS3 were removed from the dataset.

Table 3: KMO and Bartlett's Test Results

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.854
Bartlett's Test of Sphericity	Approx. Chi-Square	4844.060
	df	435
	Sig.	0.000

Source: Author's calculation

The second round of EFA yielded a KMO value of 0.842 (> 0.5) and a statistically significant Bartlett's Test (sig. = 0.000), indicating that the dataset is suitable for factor analysis (Shek & Yu, 2014).

Table 4: Summary of EFA Results

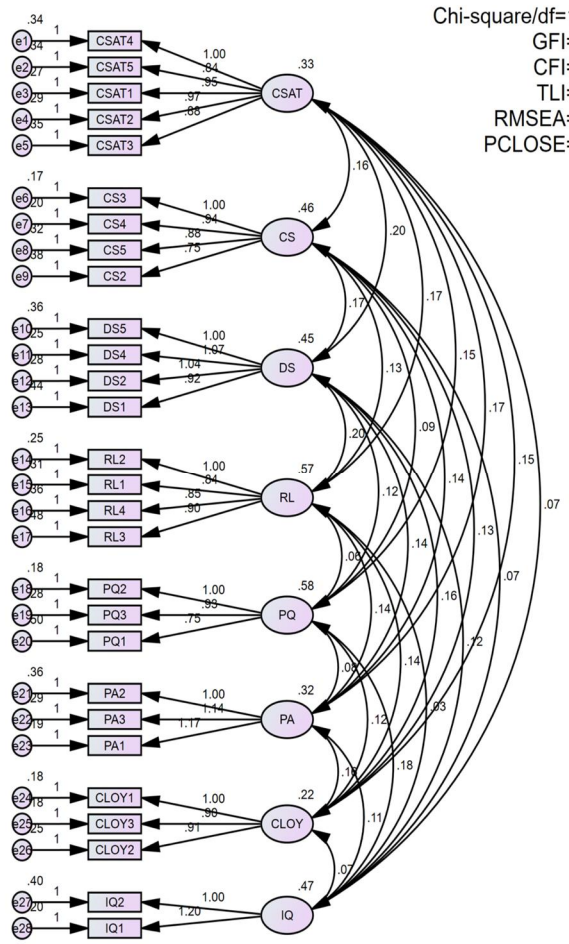
Latent Variables	Number of items	Factor Loadings (Min-Max)	Eigenvalue
Customer Satisfaction (CSAT)	5	0.658 - 0.833	7.413
Customer Service (CS)	4	0.743 - 0.885	2.420
Delivery Service (DS)	4	0.758 - 0.860	2.117
Reserve Logistics (RL)	4	0.776 - 0.833	1.804
Product Quality (PQ)	3	0.806 - 0.866	1.709
Product Availability (PA)	3	0.772 - 0.879	1.607
Customer Loyalty (CLOY)	3	0.672 - 0.866	1.276
Information Quality (IQ)	2	0.868 - 0.916	1.060
Total	30		

Source: Author's calculation

The EFA results extracted eight factors with a total variance explained of 69.308% (> 50%), which aligns well with the initial theoretical model. All observed variables had factor loadings greater than 0.5 on their corresponding latent constructs, and no significant cross-loading was detected (i.e., no item had loadings above 0.35 on more than one factor). The factor loadings ranged from 0.658 to 0.916, indicating high measurement quality. These results confirm that the eight-latent-variable structure of the proposed research model fits the empirical data and that all measurement scales meet the criteria for convergent and discriminant validity (Shek & Yu, 2014). This provides a robust foundation for conducting Confirmatory Factor Analysis (CFA) in the subsequent stage.

4.1.3. Confirmatory Factor Analysis (CFA) Results

Following the identification of the factor structure through EFA, the study proceeded with Confirmatory Factor Analysis (CFA) to validate the measurement model.



Source: Author's calculation

Figure 2: CFA Analysis Results

The CFA results indicate that the measurement model has a good fit with the empirical data, as evidenced by the following indices: Chi-square/df = 1.625 (< 3), CFI = 0.947 (> 0.90), TLI = 0.938 (> 0.90), GFI = 0.902 (> 0.90), RMSEA = 0.044 (< 0.08), PCLOSE = 0.935 (> 0.05), and SRMR = 0.042 (< 0.08). These values all meet the recommended thresholds proposed by Hair et al. (2010) and Hu and Bentler (1999), demonstrating that the measurement model fits the data very well.

Table 5: Standardized Regression Weights (CFA)

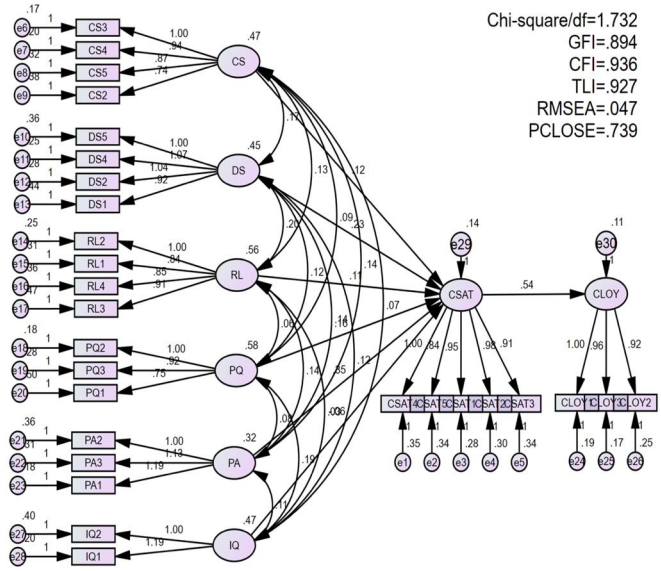
			Estimate
CSAT4	<---	CSAT	0.703
CSAT5	<---	CSAT	0.639
CSAT1	<---	CSAT	0.723
CSAT2	<---	CSAT	0.721
CSAT3	<---	CSAT	0.652
CS3	<---	CS	0.854
CS4	<---	CS	0.817
CS5	<---	CS	0.729
CS2	<---	CS	0.637
DS5	<---	DS	0.746
DS4	<---	DS	0.823
DS2	<---	DS	0.797
DS1	<---	DS	0.680
RL2	<---	RL	0.833
RL1	<---	RL	0.749
RL4	<---	RL	0.729
RL3	<---	RL	0.702
PQ2	<---	PQ	0.873
PQ3	<---	PQ	0.799
PQ1	<---	PQ	0.631
PA2	<---	PA	0.691
PA3	<---	PA	0.768
PA1	<---	PA	0.836
CLOY1	<---	CLOY	0.737
CLOY3	<---	CLOY	0.703
CLOY2	<---	CLOY	0.645
IQ2	<---	IQ	0.733
IQ1	<---	IQ	0.881

Source: Author's calculation

All standardized factor loadings for the observed variables were statistically significant ($p < 0.05$) and greater than 0.5, ranging from 0.631 to 0.881, thereby confirming the convergent validity of the measurement scales (Shek & Yu, 2014). The CFA results further validated the model's goodness of fit, reliability, convergent validity, and discriminant validity, providing a solid foundation for conducting Structural Equation Modeling (SEM) in the subsequent phase.

4.1.4. Structural Equation Modeling (SEM) Results

After confirming the validity of the measurement model through CFA, the study proceeded with Structural Equation Modeling (SEM) to examine the relationships among logistics service factors, customer satisfaction, and customer loyalty.



Source: Author's calculation

Figure 3: SEM Analysis Results

The SEM results show that the structural model fits the empirical data well, as indicated by the following fit indices: Chi-square/df = 1.732 (< 3), CFI = 0.936 (> 0.90), TLI = 0.927 (> 0.90), RMSEA = 0.047 (< 0.08), PCLOSE = 0.739 (> 0.05), and SRMR = 0.049 (< 0.08). These values all meet the thresholds recommended by Hair et al. (2010) and Hu and Bentler (1999). Additionally, GFI = 0.894 (> 0.80) is considered acceptable according to research by Baumgartner and Homburg (1996) and Doll and Xia (1997). Thus, the structural model (SEM) demonstrates a good fit with the data.

Table 6: Regression Weights (SEM)

			Estimate	S.E.	C.R.	P
CSAT	<---	CS	0.121	0.048	2.502	0.012
CSAT	<---	DS	0.228	0.056	4.088	***
CSAT	<---	RL	0.112	0.045	2.485	0.013
CSAT	<---	PQ	0.157	0.043	3.630	***
CSAT	<---	PA	0.351	0.069	5.076	***
CSAT	<---	IQ	-0.064	0.049	-1.297	0.194
CLOY	<---	CSAT	0.537	0.066	8.149	***

Source: Author's calculation

The hypothesis testing results indicate that there is no significant relationship between Information Quality (IQ) and Customer Satisfaction (CSAT), as the p-value is 0.194

(> 0.05). Therefore, Hypothesis H6 is not supported. Meanwhile, five logistics-related factors - Customer Service (CS), Delivery Service (DS), Reverse Logistics (RL), Product Quality (PQ), and Product Availability (PA) - were found to be statistically significant ($p < 0.05$) and positively influence customer satisfaction. Moreover, customer satisfaction also shows a statistically significant ($p < 0.05$) and positive effect on customer loyalty, supporting Hypothesis H7. As a result, Hypotheses H1, H2, H3, H4, H5, and H7 are accepted.

Specifically, Product Availability (PA) has the strongest impact on Customer Satisfaction (CSAT) with a standardized coefficient of $\beta = 0.351$, followed by Delivery Service (DS) with $\beta = 0.228$, Product Quality (PQ) with $\beta = 0.157$, Customer Service (CS) with $\beta = 0.121$, and Reverse Logistics (RL) with $\beta = 0.112$.

In addition, Customer Satisfaction (CSAT) has a positive effect on Customer Loyalty (CLOY) with a standardized coefficient of $\beta = 0.537$.

Table 7: Squared Multiple Correlations

	Estimate
CSAT	0.546
CLOY	0.441

Source: Author's calculation

The results indicate that logistics service factors explain 54.6% of the variance in Customer Satisfaction (CSAT) ($R^2 = 0.546$). Meanwhile, Customer Satisfaction (CSAT) accounts for 44.1% of the variance in Customer Loyalty (CLOY) ($R^2 = 0.441$).

4.2. Discussion

Overall, the findings indicate that the proposed research model has strong explanatory power. These results affirm the significant role of optimizing distribution performance in shaping customer satisfaction in online shopping, which in turn influences customer loyalty. Notably, factors directly related to product availability and delivery exert the strongest impact, suggesting that Vietnamese consumers prioritize product quality and delivery efficiency over other aspects.

The study confirms support for five hypotheses (H1, H2, H3, H4, H5) concerning the impact of logistics operations on customer satisfaction, while Hypothesis H6 was not supported. In other words, five factors - Customer Service (CS), Delivery Service (DS), Reverse Logistics (RL), Product Quality (PQ), and Product Availability (PA) - all have a positive effect on online shopper satisfaction. Among them, Product Availability showed the strongest influence, implying that ensuring timely and sufficient product supply is critical for enhancing the customer experience. Conversely, Information Quality (IQ), which involves the clarity, completeness, and accuracy of logistics information, did not significantly affect satisfaction according to the survey data.

H1 confirms that Customer Service positively influences customer satisfaction ($\beta = 0.121$, $p < 0.05$). This implies that better customer service enhances the satisfaction of online shoppers. This result is consistent with previous findings by Huang and Rust (2018) and Hafez et al. (2021), who emphasized that improving service quality leads to increased satisfaction and loyalty. In Vietnam's increasingly competitive e-commerce market, customer service has become a key differentiator among platforms. For example, platforms like Shopee and Tiki have established 24/7 customer hotlines, integrated chatbots, and live chat channels to quickly resolve inquiries and complaints. Customers who receive prompt and professional support, such as timely guidance on payment issues or satisfactory complaint resolution, tend to rate their experience more positively. On the other hand, slow or irresponsible support services often result in customer disappointment and negative impressions.

H2 demonstrates that Delivery Service has a strong influence on customer satisfaction ($\beta = 0.228$, $p < 0.05$). Faster and more reliable delivery services correlate with greater satisfaction, aligning with prior studies on the importance of timely delivery in e-commerce (Dündar & Öztürk, 2020; Yen et al., 2022). DHL eCommerce (2023) found that 94% of online shoppers in the Asia-Pacific region abandon their carts if flexible delivery options, such as modifying delivery time and location, are not provided. This trend is evident in Vietnam, where delivery speed and flexibility have become competitive advantages. In recent years, platforms like Lazada and Shopee have launched same-day or 2-hour delivery services in major cities to meet consumer expectations. Conversely, delays or missed delivery timeframes often lead to complaints and reduced satisfaction.

H3 shows that Reverse Logistics positively affects customer satisfaction ($\beta = 0.112$, $p < 0.05$). This implies that more convenient and efficient return and refund processes result in higher satisfaction levels. This aligns with Kianpour et al. (2017), who found that faster refunds (within 24 hours) increase repurchase intentions compared to slower policies. Jalil (2019) similarly emphasized that reverse logistics play a core role in building trust and satisfaction in online shopping. In Vietnam, companies have made significant improvements in this area. For example, Shopee extended its return window to 15 days in March 2024 and offers free returns for any reason. Such policies help customers feel more secure when shopping, thereby increasing satisfaction. However, complicated return procedures or delayed refunds can create frustration, discouraging repeat purchases (Sumantri et al., 2024). It is

worth noting that effective reverse logistics requires considerable cost and complex management.

H4 confirms that Product Quality has a positive impact on customer satisfaction ($\beta = 0.157$, $p < 0.05$). Higher product quality leads to greater customer satisfaction, consistent with previous findings that certified, high-quality products enhance buyer experience (Das Guru & Paulssen, 2020; Iqbal et al., 2023). In Vietnam, product quality remains a top concern for online shoppers. According to the National Competition Commission, in the first nine months of 2024, approximately 9.18% of consumer complaints related to product quality or discrepancies in received goods or delivery services. Many consumers remain hesitant about online shopping due to concerns about counterfeit or substandard products, issues not uncommon on certain platforms. Therefore, when products meet expectations and are reliable, they lead to more positive customer experiences. Conversely, defective or misleading products often result in complaints and negative reviews, directly impacting business performance.

H5 reveals that Product Availability has the strongest impact on satisfaction ($\beta = 0.351$, $p < 0.05$). This finding aligns with previous studies highlighting that maintaining stock availability helps reduce order cancellations and improve the customer experience (Vu et al., 2020; Vasić et al., 2021). In Vietnam, many online shoppers express dissatisfaction when orders are canceled due to out-of-stock issues, a frequent problem on e-commerce platforms. By maintaining sufficient inventory and updating stock status in real time, businesses can reduce cancellations and enhance satisfaction. In fact, major players like Tiki and Shopee have invested heavily in warehouse systems and third-party supplier networks to avoid stockouts, reflecting the critical importance of this factor.

H6, which proposed that Information Quality positively affects satisfaction, was not supported ($p > 0.05$), indicating no significant relationship between information quality and customer satisfaction. This contrasts with initial expectations based on prior studies that emphasized the importance of providing accurate and complete information (e.g., real-time stock updates, order status) to reduce cancellations and enhance satisfaction (Immadisetty, 2019; Lin et al., 2023; Liu et al., 2023). The rejection of H6 suggests that in the current context, Information Quality may no longer be a key differentiator in e-commerce satisfaction in Vietnam. Major platforms have widely adopted standardized information practices, leading consumers to perceive these features as default requirements rather than added value. Interview findings reinforce this interpretation. Respondents reported relying more heavily on peer reviews, short-form video content, or community-based platforms when evaluating products, rather than information directly provided by the seller. These insights suggest that Information Quality, while still functionally important, has lost its differentiating role in influencing satisfaction. As platforms converge in information standards, consumers shift their attention to user-generated content, which carries more perceived credibility and relevance in the purchase decision process.

H7 confirms that Customer Satisfaction strongly influences Customer Loyalty ($\beta = 0.537$, $p < 0.05$), implying that the more satisfied customers are, the more loyal they become, and the more likely they are to make repeat purchases. This finding is consistent with studies by Cotarelo et al. (2021), and Simanjuntak and Mayasari (2023). In Vietnam's competitive e-commerce landscape, this relationship is particularly crucial - satisfied customers not only repurchase but also recommend the service to others, becoming loyal patrons and potential brand advocates. Conversely, unsatisfactory experiences can drive customers to competitors with just a few clicks, undermining loyalty. Leading platforms like Shopee, Lazada, and Tiki are actively investing in post-purchase customer experience improvements, such as AI-powered chatbots, rating systems, and short surveys after each order. Shopee allows feedback per order on delivery, product quality, and staff attitude, while Lazada offers a "Loyalty Program" with exclusive perks for frequent buyers based on satisfaction levels. These initiatives reflect companies' recognition of customer satisfaction as a strategic factor for retaining users, crucial for sustainable growth in a highly competitive environment.

Overall, the findings of this study are consistent with existing theories and prior research on logistics service quality and customer satisfaction in e-commerce. Key factors such as fast delivery, strong customer service, product management (in terms of quality and availability), and hassle-free return policies have all been shown to enhance satisfaction, confirming the conclusions of earlier scholars. These results contribute not only to academic literature by adding evidence from an emerging market but also offer practical implications for improving e-commerce logistics services.

5. Recommendation and Conclusion

5.1. Recommendations

Based on the findings discussed above, several practical recommendations can be made to help e-commerce businesses and logistics service providers enhance customer satisfaction. These suggestions are directed at government regulators, enterprises and industry associations, and consumers.

For government agencies, authorities should play a key

role in fostering a favorable environment for improving e-commerce logistics quality. First, the government should continue to invest in and upgrade transportation and warehouse infrastructure. In particular, suburban and interprovincial areas should develop modern logistics hubs to reduce delivery time to provincial regions. Second, clear standards and regulations should be issued for e-commerce delivery services, such as maximum delivery time, responsibilities in cases of lost or damaged goods, to protect consumers and pressure businesses to improve service. Third, the government could consider offering tax incentives or financial support to businesses investing in advanced logistics technologies (e.g., smart warehouse management systems, green electric delivery vehicles). Finally, authorities should collaborate with industry associations to build shared logistics databases (e.g., digital maps of warehouse infrastructure and delivery points). These measures would help reduce logistics costs (currently ~20% of GDP) and improve service quality, thereby enhancing customer satisfaction nationwide.

For businesses and e-commerce associations, enterprises and industry bodies must proactively enhance logistics operations to meet rising customer expectations. First, companies should invest in supply chain technology, such as using AI to optimize delivery routes and IoT for real-time order tracking, to reduce delivery times and minimize errors. Second, intra-industry collaboration should be promoted through associations: e-commerce platforms can share warehouse networks or drop-off points in certain regions to optimize infrastructure usage and reduce last-mile costs. Third, standardized reverse logistics processes should be developed with the support of associations, for instance, unified guidelines for returns and fast refunds, ensuring a consistent, trustworthy experience across the market. Moreover, businesses should regularly train delivery and customer service staff in skills and professionalism. Lastly, associations should establish a system to periodically collect customer feedback on logistics services, allowing industry players to continuously improve and raise overall service standards.

For consumers, individual buyers also play a vital role in improving e-commerce logistics efficiency. First, buyers should be more proactive in receiving orders: providing accurate addresses and phone numbers, tracking order status, and coordinating with couriers when necessary (e.g., arranging suitable delivery times). This helps reduce failed delivery attempts and enhances their own experience. Second, consumers should fully exercise their rights - using return/refund policies when products are unsatisfactory, and leaving constructive feedback on platforms. Genuine reviews from customers encourage sellers and platforms to improve their logistics services. Third, consumers should carefully select reputable sellers with good logistics performance - for example, prioritizing those with high on-time delivery rates, careful packaging, and positive after-sales feedback. Platforms now disclose seller-specific delivery times and return policies - customers should leverage this information to make informed decisions. In the long term, smart choices and constructive feedback from consumers will generate market pressure, compelling logistics providers to improve service quality and shaping a customer-centric, healthy e-commerce ecosystem.

These recommendations focus on logistics factors shown in this study to significantly influence customer satisfaction, while also reflecting recent trends in the e-commerce logistics sector.

5.2. Conclusion

Amid Vietnam's rapidly expanding and competitive e-commerce landscape, this study highlights that logistics and distribution are not merely a supporting function but a strategic driver of customer satisfaction and loyalty. Theoretically, the study extends existing LSQ literature by examining six logistics service dimensions, revealing that IQ no longer plays a significant role in satisfaction, contrary to prior assumptions. Practically, the findings offer clear priorities for e-commerce firms, emphasizing investment in areas like product availability, delivery service, and reverse logistics to enhance customer experience and build long-term loyalty. Methodologically, the integration of both qualitative interviews and quantitative SEM analysis strengthens the validity of insights and demonstrates a mixed-method approach applicable to future logistics distribution studies in emerging markets. This study also lays the groundwork for further research and serves as a practical reference for businesses and policymakers aiming to optimize customer experience through logistics, a critical success factor in today's digital trade and supply chain economy.

Despite its meaningful findings, this study has some limitations. First, the survey sample was geographically limited (mostly in major cities), so generalizability to the entire Vietnamese e-commerce market may be constrained. Demographic or regional differences (e.g., between urban and rural customer expectations) were not fully explored. Second, the research model did not cover all potential factors influencing satisfaction. For instance, delivery cost or platform brand reputation may also play significant roles, but were not analyzed. Future studies could expand the sample in terms of location and time, conducting surveys across more provinces or comparing Vietnam with similar regional markets, to validate the consistency of the findings. Additionally, future models should consider adding new variables, such as the impact of free shipping strategies, personalized services, or the adoption of advanced

technologies (AI, IoT in logistics distribution) on customer experience.

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