



**THE 12th INTERNATIONAL CONFERENCE
FOR YOUNG RESEARCHERS IN ECONOMICS AND BUSINESS
(ICYREB 2026)**

CONFERENCE PROCEEDINGS



Hanoi, August 2026



FINANCIAL ECONOMICS PUBLISHING HOUSE



The 12th International Conference For Young Researchers In Economics And Business
(ICYREB 2026)

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FOREWORD

On behalf of the Organizing Committee, it is our great pleasure to present the Proceedings of the 12th International Conference for Young Researchers in Economics and Business (ICYREB 2026), held on 7 August 2026 at the Banking Academy of Vietnam, Hanoi.

ICYREB 2026 is jointly organized by the Banking Academy of Vietnam in collaboration with an esteemed network of partner universities, including the National Economics University, Thuongmai University, Foreign Trade University, Vietnam Academy of Finance, VNU University of Economics & Business, the University of Economics - Hue University, the University of Economics - The University of Danang, University of Economics Ho Chi Minh City, the University of Economics and Law (VNU Ho Chi Minh City), and Phenikaa University.

Under the theme “Enhancing Economic Resilience amidst Global Uncertainties: From Digital Transformation to Sustainability”, this volume brings together 193 accepted papers contributed by young researchers, doctoral students and scholars from Vietnam and abroad. The papers are organized into seven thematic chapters: (1) Corporate finance and corporate governance; (2) Financial stability, regulatory frameworks, and macroprudential policies in a rapidly evolving global context; (3) Financial technology (FinTech), big data analytics, behavioral finance, and financial inclusion; (4) Digital transformation and human capital development in the financial system; (5) Climate-related risks, biodiversity, and sustainability-related financial disclosures; (6) Global economic uncertainty and trade tensions; and (7) Banking, banking systems, and macroeconomic policy.

We are honored to welcome Professor Duc Duy (Louis) Nguyen of Durham University, United Kingdom, and Professor Fengsheng Chien of the Fuzhou Institute of Foreign Studies and Trade, as keynote speakers of this year's conference. We also gratefully acknowledge the generous support of our sponsor, the Joint Stock Commercial Bank for Investment and Development of Vietnam (BIDV), and our associated journal, the Journal of Economic & Banking Studies (JEBS).

We would like to express our sincere gratitude to the members of the Organizing Committee and the Scientific Program Committee for their rigorous review and valuable comments, which have greatly contributed to the academic quality of this proceedings volume. We also thank all authors for their contributions and their patience throughout the editing and formatting process.

It is our hope that this proceedings volume will serve as a meaningful reference for researchers, practitioners and policy makers, and that ICYREB will continue to grow as a platform that nurtures the next generation of scholars in economics, finance and business.

The Organizing Committee, ICYREB 2026

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VALIDATING AN E-COMMERCE LOGISTICS SERVICE QUALITY SCALE IN A DEVELOPING CITY: EVIDENCE FROM HUE CITY, VIETNAM

Le Thi Phuong Thanh^{a✉}, Le Thi Phuong Thao^a, Tong Viet Bao Hoang^a,

Hoang Viet Hanh Nguyen^a

a University of Economics, Hue University, Hue city, Vietnam

ABSTRACT

This study validates an E-commerce Logistics Service Quality (ELSQ) scale in the context of a developing city, using Hue City, Vietnam, as the empirical setting. Drawing on logistics service quality, e-service quality, and e-commerce logistics literature, the study proposes a multidimensional ELSQ scale comprising seven dimensions: timeliness, order condition, order accuracy, delivery availability and accessibility, information quality and tracking, return and discrepancy handling, and technology, security and payment convenience. A mixed-methods approach was adopted, including literature review, expert consultation, pilot testing, and a quantitative survey of 300 e-commerce customers in Hue City. Exploratory Factor Analysis and Confirmatory Factor Analysis were employed to assess the dimensionality, reliability, convergent validity, and discriminant validity of the proposed scale. The results confirm a stable seven-factor structure with satisfactory model fit, composite reliability, average variance extracted, and discriminant validity. The findings indicate that e-commerce logistics service quality in a developing city is shaped not only by delivery timeliness and order accuracy but also by accessibility, information transparency, return handling, and technology-enabled service convenience. This study contributes to the logistics and e-commerce literature by providing a validated measurement instrument for assessing ELSQ in emerging urban contexts. It also offers practical implications for e-commerce platforms and logistics providers seeking to improve customer-oriented logistics performance in developing cities.

Keywords: *E-commerce logistics; E-Logistics service quality; Scale validation; Developing city; Hue City; Vietnam.*

1. Introduction

1.1 Research background

The rapid expansion of e-commerce has profoundly reshaped consumer purchasing behavior, particularly in developing economies. Along with this growth, logistics has become a critical component of the e-commerce value chain, directly influencing customers' post-purchase experiences. Unlike traditional retailing, where customers receive products immediately, e-commerce transactions rely heavily on logistics processes such as order fulfillment, delivery timeliness, shipment accuracy, and return handling (Hübner et al., 2016)

In the e-commerce context, logistics service quality (LSQ) is increasingly viewed as a strategic driver of competitive advantage rather than merely an operational function (Mentzer, Flint, et al., 2001). Prior studies have consistently shown that effective logistics performance enhances customer satisfaction and strengthens long-term customer relationships (Hsiao et al., 2010; Rafiq & Jaafar, 2007). As competition among online marketplaces intensifies, customers' evaluations of logistics services play a pivotal role in shaping overall perceptions of e-commerce platforms.

Despite the growing importance of logistics in e-commerce, the measurement of logistics service quality remains challenging. Most existing LSQ measurement scales were originally developed and validated in developed economies, where logistics infrastructure, service standards, and consumer expectations differ markedly from those in developing countries (Thai, 2013). Consequently, the applicability of these scales in emerging market contexts cannot be taken for granted and requires empirical reassessment.

1.2 Research gap

Although the literature on e-commerce logistics service quality has expanded substantially, several important gaps persist. First, prior studies have predominantly emphasized the consequences of logistics service quality, such as customer satisfaction, loyalty, and repurchase intention (Collier & Bienstock, 2006; Vakulenko et al., 2019). In contrast, relatively limited attention has been paid to the validation of LSQ measurement instruments themselves. Measurement quality is often assumed rather than rigorously tested within specific empirical contexts.

Second, empirical research validating LSQ scales in developing economies remains scarce. Existing studies tend to focus on national-level samples or major metropolitan areas, while secondary or developing cities are largely overlooked. These cities often exhibit distinct logistics characteristics, including less developed infrastructure, higher delivery uncertainty, and different consumer expectations (Hübner et al., 2016). As e-commerce growth increasingly extends beyond major urban centers, understanding logistics service quality in these contexts becomes essential.

Third, Vietnam represents one of the fastest-growing e-commerce markets in Southeast Asia, yet empirical evidence on logistics service quality measurement in this context is still limited. Hue City, as a developing city with unique socio-economic conditions, offers a valuable setting to reassess whether established LSQ dimensions remain valid and reliable. Addressing these gaps contributes to a more nuanced understanding of logistics service quality measurement in emerging urban environments.

1.3 Research objectives and contributions

In response to the identified gaps, this study aims to validate an e-commerce logistics service quality scale in the context of a developing city, using Hue City, Vietnam, as an empirical case.

Specifically, this study pursues three main objectives. First, it examines whether logistics service quality in e-commerce can be conceptualized as a multidimensional construction in a developing city context. Second, it evaluates the reliability and validity of the proposed ELSQ dimensions using established psychometric techniques, including confirmatory factor analysis.

This study offers several contributions. Theoretically, it extends the logistics and service quality literature by validating ELSQ measurement in a developing urban context, thereby enhancing the generalizability of existing scales. Methodologically, it provides rigorous empirical evidence on the reliability and validity of LSQ constructs in e-commerce settings. Practically, the validated scale offers e-commerce platforms and logistics service providers a reliable tool to assess and improve logistics performance in similar developing city environments.

2. Literature Review and Hypotheses Development

2.1 E-commerce logistics service quality

Logistics service quality refers to customers' overall assessment of logistics-related activities that facilitate the movement of goods from sellers to end consumers (Mentzer, Flint, et al., 2001). In e-commerce settings, logistics service quality encompasses a broader range of processes than

traditional retail logistics, including order processing, last-mile delivery, real-time shipment tracking, and reverse logistics.

Because customers in online transactions rarely interact directly with sellers after placing an order, logistics services represent the primary post-purchase contact point between customers and service providers (Vakulenko et al., 2019). Consequently, logistics performance strongly shapes customers' evaluations of the overall service quality of e-commerce platforms. Delays, delivery errors, or damaged products may therefore undermine trust and satisfaction, even when the core product meets expectations.

As e-commerce has grown rapidly, scholars have developed new frameworks to measure service quality in online environments. One prominent model is E-S-QUAL, which was proposed to evaluate electronic service quality in online retail platforms (Parasuraman et al., 2005). The E-S-QUAL model includes four key dimensions: efficiency, fulfillment, system availability, and privacy.

Efficiency refers to the ease and speed with which customers can access and use an online platform. Fulfillment represents the degree to which the retailer delivers products as promised. System availability refers to the technical functioning of the website, while privacy concerns the protection of customer data during online transactions. The E-S-QUAL model has been widely applied to measure service quality in digital platforms.

However, several researchers have noted that E-S-QUAL primarily focuses on the online interface and system performance rather than the logistics processes that occur after an order is placed. In practice, customers evaluate their online shopping experiences not only based on website functionality but also on the quality of delivery services. Delayed deliveries, damaged products, or poor communication regarding order status can significantly reduce customer satisfaction even if the online shopping interface functions effectively (Collier & Bienstock, 2006).

Therefore, integrating logistics service quality into e-commerce service quality frameworks has become an important research topic. Scholars have argued that logistics-related factors such as delivery reliability, speed, and product condition are critical components of the overall online shopping experience (Hübner et al., 2016). As a result, developing measurement scales that capture these logistics-related dimensions is essential for understanding customer perceptions in e-commerce contexts.

2.2 Dimensions of logistics service quality in e-commerce

Prior research suggests that logistics service quality is a multidimensional construct comprising several distinct but interrelated dimensions. Drawing on the logistics and service quality literature, five dimensions are particularly salient in e-commerce contexts.

Delivery timeliness refers to the extent to which products are delivered within the promised or expected time frame. Timely delivery is critical in online shopping, as customers often rely on estimated delivery dates when making purchase decisions (Rafiq & Jaafar, 2007).

Order accuracy reflects the degree to which delivered items match customers' orders in terms of product type, quantity, and specifications. Errors in order fulfillment may increase return rates and negatively affect customer evaluations (Mentzer, Flint, et al., 2001).

Order condition captures customers' perceptions of the physical state of products upon delivery. Damage caused during transportation or inadequate packaging signals poor logistics handling and reduces perceived service quality (Hsiao et al., 2010).

Information quality, particularly in terms of order tracking and delivery updates, refers to the accuracy, timeliness, and transparency of logistics-related information provided to customers. High-quality information reduces uncertainty and enhances customers' sense of control during the delivery process (Collier & Bienstock, 2006).

Return and reverse logistics represent the ease and efficiency with which customers can return or exchange products. Given the inherent uncertainty in online shopping, effective return processes constitute a crucial component of logistics service quality in e-commerce (Vakulenko et al., 2019).

2.3 Scale validation in emerging market contexts

Measurement scales developed in one context may not be directly transferable to other contexts due to differences in culture, infrastructure, and consumer expectations (Thai, 2013). Emerging markets often face challenges such as fragmented logistics networks, uneven service standards, and limited last-mile delivery capabilities, which may influence how customers perceive logistics service quality.

As a result, scholars increasingly emphasize the importance of validating established measurement scales when applying them to new empirical settings (Hair et al., 2019). Validation involves assessing the dimensionality, reliability, and validity of constructs to ensure that they accurately capture the underlying phenomenon. Without such validation, empirical findings may suffer from measurement bias and limited generalizability.

In developing city contexts, where logistics services are still evolving, certain LSQ dimensions may be perceived differently or carry varying levels of importance. This underscores the necessity of empirically re-examining existing LSQ scales rather than assuming their universal applicability.

3. Methodology

This study employed a mixed-methods approach combining qualitative and quantitative methodologies to develop and validate an E-commerce Logistics Service Quality (ELSQ) scale in the context of Hue. First, a theoretical review was conducted to clarify the concept and dimensions of ELSQ by synthesizing previous studies from reputable WoS- and Scopus-indexed journals. Based on the literature review, the proposed ELSQ scale and research model were established with observed variables reflecting key dimensions of e-commerce logistics service quality. Subsequently, expert interviews were conducted to evaluate the relevance, clarity, and comprehensiveness of the proposed scale. The expert panel included academics specializing in logistics and supply chain management as well as managers from logistics and e-commerce-related firms in Hue City. Their evaluations contributed to refining the scale and ensuring content validity through the Content Validity Ratio (CVR) method. After the qualitative stage, Exploratory Factor Analysis (EFA) was employed to examine the structure of the proposed scale. Using a convenience sampling approach, survey data were collected from customers using e-commerce logistics services in Hue City, ensuring an adequate sample size for factor analysis. Finally, Confirmatory Factor Analysis (CFA) was conducted using AMOS 24 to assess the model fit and validate the scale through indicators such as CMIN/df, GFI, AGFI, RMSEA, Composite Reliability (CR), Average Variance Extracted (AVE), and discriminant validity measures. The findings provide empirical evidence for the reliability and validity of the ELSQ scale in a developing city context, contributing to both theory and practice in e-commerce logistics management.

4. Research Result

4.1. Sample structure and characteristics

Table 1 presents the demographic profile and online shopping characteristics of the respondents. The sample includes 300 valid respondents aged 20 years and above who had prior experience with e-commerce delivery services in Hue City. Female respondents account for 54.0% of the sample, while male respondents represent 46.0%. In terms of age, the largest group is between 20 and 29 years old, accounting for 46.0%, followed by the 30–39 age group at 28.0%. This indicates that the sample is dominated by digitally active young and middle-aged consumers, who are more likely to engage in online shopping. Most respondents hold a university degree, accounting for 58.0%, while 13.0% have postgraduate education. Regarding occupation, office workers represent the largest group at 32.0%, followed by students and self-employed respondents, each accounting for 19.0%. In terms of online shopping behavior, nearly half of the respondents have more than four years of online shopping experience, and 25.0% purchase online more than six times per month.

Table 1. sample structure and characteristics

Control variables	Category	No	Percentage %
Gender	Male	138	46.0
	Female	162	54.0
Age	Between 20 and 29	138	46.0
	Between 30 and 39	84	28.0
	Between 40 and 49	48	16.0
	50 and above	30	10.0
Education	High school or below	33	11.0
	College	54	18.0
	University	174	58.0
	Postgraduate studies	39	13.0
Occupation	Student	57	19.0
	Office worker	96	32.0
	Self-employed/Small business owner	57	19.0
	Public sector employee	45	15.0
	Other	45	15.0
Length of online shopping experience	Less than 1 year	24	8.0
	1–2 years	48	16.0
	3–4 years	87	29.0
	More than 4 years	141	47.0

Control variables	Category	No	Percentage %
Online shopping frequency	1–2 times per month	69	23.0
	3–4 times per month	96	32.0
	5–6 times per month	60	20.0
	More than 6 times per month	75	25.0

Source: Processing survey data in 2026

4.2. Summary results of the scale and proposed model

The measurement scale used in this study was adapted from previous studies on Logistics Service Quality, e-commerce service quality, and e-logistics. The proposed E-commerce Logistics Service Quality (ELSQ) scale was conceptualized as a second-order construct consisting of seven dimensions: timeliness, order condition, order accuracy, delivery availability and accessibility, information quality and tracking, return and discrepancy handling, and technology, security, and payment convenience. A total of 29 observed variables were adapted and modified to fit the e-commerce context in Hue. The customer satisfaction construct was measured using three observed variables adapted from Oliver (1980), Anderson et al. (1994), and Eid (2011). All measurement items were assessed using a five-point Likert scale ranging from 1 (“strongly disagree”) to 5 (“strongly agree”). The scales were refined through expert interviews and pilot testing before conducting the official survey.

Table 2: The scale of E-commerce Logistics Service quality

Code	Measurement Items	Source
I. Timeliness (TIM)		
TIM1	My online orders are delivered within the promised time.	(Akıl & Ungan, 2022)
TIM2	The delivery time is consistent with the estimated time shown when I place the order.	
TIM3	The delivery service is fast enough for my expectations.	(Mentzer, DeWitt, et al., 2001; Vu & Nguyen, 2025)
TIM4	Delays in delivery rarely occur when I shop online.	(Akıl & Ungan, 2022)
TIM5	Even during peak periods, my orders are delivered in an acceptable time.	
II. Order Condition (OCN)		
OCN1	Products are delivered in good condition.	(Mentzer, DeWitt, et al., 2001; Vasić et al., 2021)
OCN2	Product packaging is adequate to protect the items during delivery.	
OCN3	Products are rarely damaged during transportation.	(Akıl & Ungan, 2022)
OCN4	Fragile or sensitive products are handled carefully.	(Vasić et al., 2021)

III. Order Accuracy (OAC)

- OAC1 I receive the exact products that I ordered.
- OAC2 The quantity of delivered products is correct. (Akıl & Ungan, 2022; Mentzer, DeWitt, et al., 2001)
- OAC3 Wrong items are rarely delivered to me.
- OAC4 My orders are fulfilled accurately without mistakes.

IV. Delivery Availability & Accessibility (DAA)

- DAA1 Delivery services are available in the areas where I usually receive orders in Hue City. (Vu & Nguyen, 2025)
- DAA2 I can receive online orders conveniently at my home, workplace, or other preferred locations. (Vu & Nguyen, 2025; Zennaro et al., 2022)
- DAA3 The delivery service is accessible even in suburban or less central areas of Hue City.
- DAA4 Delivery staff can contact me easily when delivering orders.

V. Information Quality & Tracking (IQT)

- IQT1 Tracking information about my order is accurate.
- IQT2 I can easily monitor the delivery status of my order. (Mentzer, DeWitt, et al., 2001; Parasuraman et al., 2005; Zennaro et al., 2022)
- IQT3 I receive timely notifications about delivery progress.
- IQT4 I am clearly informed when there are delivery delays or changes.

VI. Return and Discrepancy Handling (RDH)

- RDH1 It is easy to report a delivery problem or order discrepancy.
- RDH2 Return or exchange requests are handled quickly.
- RDH3 The return process is convenient for customers. (Akıl & Ungan, 2022; Mentzer, DeWitt, et al., 2001; Zennaro et al., 2022)
- RDH4 Problems such as wrong, damaged, or missing items are resolved fairly.

VII. Technology, Security & Payment Convenience (TSP)

- TSP1 The logistics/payment process provides a sense of security when I shop online.
- TSP2 Electronic payment or cash-on-delivery options are convenient for me. (Parasuraman et al., 2005)
- TSP3 The delivery system uses technology effectively to reduce errors.
- TSP4 My personal information related to delivery is handled safely.

4.3. Results of exploration factor analysis of E-commerce Logistics Service quality scale

Table 3 presents the rotated factor matrix obtained from the Exploratory Factor Analysis (EFA) for the E-commerce Logistics Service Quality scale. The results indicate that the observed items were extracted into seven distinct factors, reflecting a clear and interpretable measurement structure. All factor loadings are above the commonly accepted threshold of 0.50, ranging from 0.502 to 0.961, which suggests that the retained items have adequate explanatory power for their respective latent constructs.

The first factor, represented by TIM1–TIM5, shows the strongest and most stable factor loadings, ranging from 0.789 to 0.961. This indicates that timeliness-related attributes form a highly coherent dimension of e-commerce logistics service quality. The second factor, including RDH1–RDH4, also demonstrates acceptable loadings from 0.557 to 0.921, confirming the relevance of these items in explaining the corresponding service quality dimension.

The third factor consists of TSP1–TSP4, with loadings between 0.557 and 0.883, while the fourth factor, represented by OCN1–OCN4, records loadings from 0.609 to 0.866. These results suggest that both constructs are sufficiently represented by their observed variables. Similarly, the fifth factor, DAA1–DAA4, has loadings ranging from 0.502 to 0.932. Although DAA1 and DAA2 are relatively close to the minimum threshold, they remain statistically acceptable and may be retained for further validation.

The sixth factor comprises OAC1–OAC4, with factor loadings between 0.505 and 0.808, indicating an acceptable but comparatively moderate level of item convergence. Finally, the seventh factor, including IQT1–IQT4, reports loadings from 0.626 to 0.687, showing that the items consistently contribute to the measurement of this dimension.

Overall, the EFA results provide preliminary evidence for the construct validity of the proposed E-commerce Logistics Service Quality scale. The seven-factor solution demonstrates a relatively clear factor structure, with no substantial cross-loading reported in the rotated matrix. Therefore, the scale is considered suitable for subsequent Confirmatory Factor Analysis (CFA). However, items with loadings close to 0.50, particularly DAA1, OAC3, and OAC1, should be carefully examined in the next stage to ensure the robustness and stability of the measurement model in the context of Hue City, Vietnam.

Table 3. Results of exploration factor analysis EFA of E-commerce Logistics Service scale

Observation variable	Factors						
	1	2	3	4	5	6	7
TIM5	0.961						
TIM3	0.858						
TIM4	0.800						
TIM1	0.798						
TIM2	0.789						
RDH4		0.921					

Observation variable	Factors						
	1	2	3	4	5	6	7
RDH1		0.767					
RDH3		0.672					
RDH2		0.557					
TSP4			0.883				
TSP2			0.852				
TSP3			0.579				
TSP1			0.557				
OCN4				0.866			
OCN3				0.662			
OCN2				0.626			
OCN1				0.609			
DAA4					0.932		
DAA3					0.690		
DAA2					0.547		
DAA1					0.502		
OAC4						0.808	
OAC2						0.784	
OAC1						0.550	
OAC3						0.505	
IQT3							0.687
IQT4							0.670
IQT1							0.658
IQT2							0.626

Source: Processing survey data in 2026

4.4. Results of confirmatory factor analysis of E-commerce Logistics Service quality scale

4.4.1. Testing the convergent and discriminant validity of the model.

Table 4 reports the convergent validity results of the proposed E-commerce Logistics Service Quality measurement model. The Composite Reliability (CR) values of all seven constructs range from 0.762 to 0.924, which are above the commonly accepted benchmark of 0.70. This indicates that the indicators used to measure each construct are internally consistent and sufficiently reliable.

In addition, the Average Variance Extracted (AVE) values range from 0.538 to 0.710, all exceeding the recommended cut-off value of 0.50. This result demonstrates that each construct captures a greater proportion of variance from its own indicators than from measurement error, thereby supporting the convergent validity of the scale. Among the dimensions, Timeliness shows the strongest measurement performance, with the highest CR value (0.924) and AVE value (0.710). Meanwhile, the remaining constructs, including Order Condition, Order Accuracy, Delivery Availability and Accessibility, Information Quality and Tracking, Return and Discrepancy Handling, and Technology, Security and Payment Convenience, also satisfy the required validity criteria.

These findings suggest that the proposed scale has adequate reliability and convergent validity. Therefore, the seven-factor structure can be considered suitable for measuring E-commerce Logistics Service Quality in the context of Hue City, Vietnam, and can be retained for subsequent stages of model assessment.

Table 4. Testing the convergent validity of the model

Factors	Composite reliability (CR)	Total extracted variance (AVE)
Timeliness	0.924	0.710
Order Condition	0.792	0.593
Order Accuracy	0.767	0.563
Delivery Availability & Accessibility	0.780	0.584
Information Quality & Tracking	0.762	0.546
Return and Discrepancy Handling	0.826	0.550
Technology, Security & Payment Convenience	0.817	0.538

Source: Processing survey data in 2026

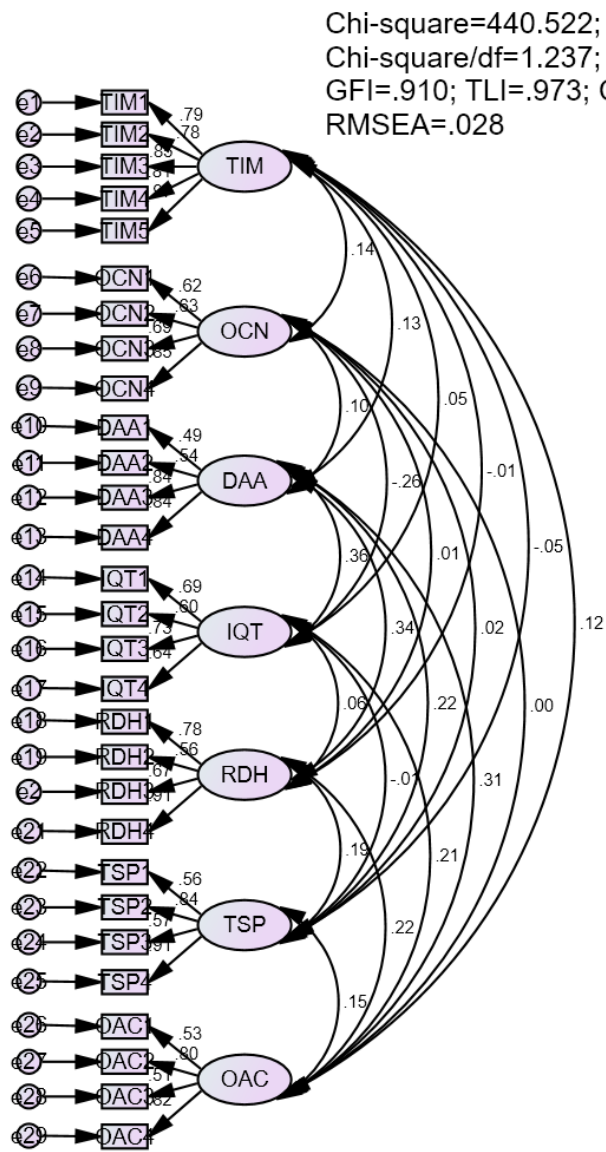


Fig 1. Results of CFA analysis of the factors constituting of E-commerce Logistics Service quality scale

Source: Processing survey data in 2026

Table 5. Test of discriminant validity of the model

	TSP	TIM	OCN	DAA	IQT	RDH	OAC
TSP	0.734						
TIM	0.247	0.843					
OCN	0.221	0.140	0.702				
DAA	0.219	0.133	0.102	0.696			
IQT	0.307	0.253	0.262	0.364	0.668		
RDH	0.187	0.207	0.211	0.344	0.061	0.742	
OAC	0.151	0.116	0.202	0.310	0.211	0.223	0.680

Source: Processing survey data in 2026

Figure 1 and Table 5 jointly provide evidence for the validity of the E-commerce Logistics Service Quality measurement model. The CFA results indicate that the proposed seven-factor

structure achieved a satisfactory model fit. Although the Chi-square statistics were significant, which is common in relatively large samples, the normed Chi-square value was acceptable, with $\text{CMIN}/\text{df} = 1.237$, well below the recommended threshold of 3. In addition, the goodness-of-fit indices were within acceptable ranges, including $\text{GFI} = 0.910$, $\text{TLI} = 0.973$, $\text{CFI} = 0.976$, and $\text{RMSEA} = 0.028$. These results suggest that the observed data fit the proposed measurement model well and that the seven dimensions are appropriate for representing E-commerce Logistics Service Quality in the research context.

The CFA model also shows that the observed indicators are meaningfully associated with their corresponding latent constructs, including Timeliness (TIM), Order Condition (OCN), Delivery Availability and Accessibility (DAA), Information Quality and Tracking (IQT), Return and Discrepancy Handling (RDH), Technology, Security and Payment Convenience (TSP), and Order Accuracy (OAC). This supports the multidimensional nature of E-commerce Logistics Service Quality, indicating that customers evaluate logistics service quality not only through delivery speed, but also through order accuracy, information transparency, product condition, return handling, accessibility, and technology-related convenience.

Table 4 further confirms the discriminant validity of the measurement model. The square roots of AVE, shown on the diagonal, range from 0.668 to 0.843, while the inter-construct correlations are all lower than their corresponding diagonal values. For example, the square root of AVE for Timeliness is 0.843, which is higher than its correlations with other constructs. Similarly, Return and Discrepancy Handling has a diagonal value of 0.742, exceeding its correlations with the remaining dimensions. This pattern indicates that each construct shares more variance with its own indicators than with other constructs in the model.

Overall, the combined CFA and discriminant validity results demonstrate that the proposed E-commerce Logistics Service Quality scale has a stable and reliable measurement structure. The seven dimensions are empirically distinct while still reflecting different aspects of the same broader service quality concept. Therefore, the scale can be considered suitable for subsequent analysis and for measuring customers' perceptions of e-commerce logistics service quality in Hue City, Vietnam.

4.4.2. Discussion

The present study provides empirical evidence for the validity of an E-commerce Logistics Service Quality (ELSQ) scale in the context of Hue City, Vietnam. Overall, the findings support the argument that logistics service quality in e-commerce should be understood as a multidimensional construct rather than a single-dimensional concept. The EFA results extracted seven distinct factors, namely Timeliness, Order Condition, Order Accuracy, Delivery Availability and Accessibility, Information Quality and Tracking, Return and Discrepancy Handling, and Technology, Security and Payment Convenience. This structure is consistent with the view that customers evaluate logistics services through multiple operational and relational attributes across the entire online purchasing process, from order placement and delivery to post-delivery support (Mentzer et al., 2001; Collier & Bienstock, 2006; Rao et al., 2011). The seven-factor structure identified in this study also extends previous e-commerce logistics studies by incorporating context-specific dimensions that are particularly relevant to developing urban environments, such as delivery accessibility and technology-enabled service convenience.

The strong performance of the Timeliness dimension is an important finding. Among all dimensions, Timeliness recorded the highest composite reliability and average variance extracted, indicating that customers in Hue City perceive delivery punctuality and delivery speed as highly

coherent indicators of e-commerce logistics service quality. This result is consistent with prior studies emphasizing that time-related logistics performance is a critical determinant of customer evaluations in online shopping contexts (Rafiq & Jaafar, 2007; Akil & Urgan, 2022). In e-commerce, customers cannot obtain products immediately after purchase; therefore, the promised delivery time becomes a key reference point for evaluating service performance. Delays may not only create inconvenience but also reduce customers' confidence in the reliability of online sellers and logistics providers. This finding is particularly relevant in developing cities, where logistics infrastructure and delivery networks may be less mature than in major metropolitan areas.

The Order Condition dimension was also confirmed as a valid component of the ELSQ scale. This suggests that customers attach considerable importance to receiving products in good physical condition. In online shopping, customers are unable to inspect products before purchase, making the delivery stage particularly important for confirming product value. Damaged products, inadequate packaging, or careless handling may lead to dissatisfaction, return requests, and negative perceptions of the e-commerce platform. This finding is in line with Mentzer et al. (2001), who identified order condition as a fundamental element of logistics service quality, and with Vasic et al. (2021), who suggested that damaged deliveries may reduce customer satisfaction and increase post-purchase service costs. In the context of Hue City, this dimension is meaningful because local customers purchase a wide range of online products, including fragile goods, household items, cosmetics, and fashion products, all of which require careful handling and proper packaging.

Order Accuracy represents another important dimension confirmed by the measurement results. The retained items indicate that customers evaluate logistics service quality based on whether the delivered products correspond to the original order in terms of type, quantity, and specifications. This result supports previous logistics service quality research showing that order accuracy reflects operational competence and fulfillment reliability (Mentzer et al., 2001; Politis et al., 2014; Rao et al., 2011). In e-commerce, inaccurate deliveries may generate additional burdens for customers, including complaint submission, return processing, and waiting for replacement products. Therefore, order accuracy should not be treated merely as an operational indicator but as a central component of perceived service quality. Although some order accuracy items reported relatively moderate factor loadings, they remained above the acceptable threshold, suggesting that this dimension is still empirically meaningful in the Hue context.

A notable contribution of this study is the inclusion and validation of Delivery Availability and Accessibility as a distinct dimension. Previous studies on logistics service quality often focus on delivery speed or reliability, while less attention has been paid to whether delivery services are equally accessible across different locations. In developing city contexts, however, delivery accessibility can become a crucial issue because logistics networks may vary between central areas, suburban districts, and peripheral locations. The confirmation of this dimension suggests that customers in Hue City evaluate logistics service quality not only by how fast orders are delivered but also by whether logistics providers can conveniently reach their preferred delivery locations. This finding complements Kawa and Swiatowiec-Szczepańska's (2021) argument that convenient delivery locations and flexible delivery options contribute to logistics value in e-commerce. It also reinforces the need to adapt LSQ scales to local infrastructure conditions rather than directly transferring scales developed in more advanced logistics environments.

The Information Quality and Tracking dimension was also supported, although its reliability and AVE values were comparatively lower than those of Timeliness. This result indicates that while

tracking information, delivery notifications, and communication transparency are relevant to customers, the measurement items may need further refinement in future studies. In e-commerce, information quality reduces uncertainty during the waiting period between order placement and delivery. Customers increasingly expect accurate, timely, and easy-to-access information about order status, delivery progress, and possible delays. This finding is consistent with Collier and Bienstock (2006), who emphasized the role of information in e-retailing service quality, and with Kawa and Swiatowiec-Szczepańska (2021), who found delivery monitoring to be an important logistics value component influencing customer satisfaction. For developing cities such as Hue, transparent delivery information may be especially important because delivery times can be affected by weather, traffic conditions, and uneven logistics coverage.

Return and Discrepancy Handling emerged as a reliable and distinct component of the ELSQ scale. This finding confirms the importance of post-delivery logistics services in e-commerce. Unlike traditional retailing, online purchasing involves a higher degree of uncertainty because customers cannot physically examine products before purchase. As a result, the ability to report problems, return products, exchange items, and resolve discrepancies becomes an essential part of perceived logistics service quality. This result is aligned with Vakulenko et al. (2018), who emphasized the role of last-mile delivery and return processes in shaping customer value, and with Akil and Ungan (2022), who identified discrepancy handling as a significant factor in e-commerce logistics service quality. In practical terms, this finding implies that logistics providers and online retailers should view returns not only as a cost burden but also as an opportunity to recover service failures and strengthen customer trust.

The validation of Technology, Security and Payment Convenience further reflects the changing nature of logistics service quality in digital commerce. Traditional LSQ scales were largely developed around physical distribution attributes, such as delivery timeliness, product availability, and order condition. However, in e-commerce, logistics services are increasingly integrated with digital platforms, electronic payments, tracking technologies, and customer data systems. The confirmation of this dimension suggests that customers in Hue City consider technological convenience and perceived security as part of their logistics service experience. This is consistent with the E-S-QUAL framework, which highlights system availability and privacy as core dimensions of electronic service quality (Parasuraman et al., 2005), and with studies emphasizing the role of technology in logistics service quality and online trust.

The CFA results further strengthen the empirical credibility of the proposed scale. The model fit indices, including CMIN/df = 1.237, GFI = 0.910, TLI = 0.973, CFI = 0.976, and RMSEA = 0.028, indicate that the seven-factor measurement model fits the data well. In addition, all CR values exceeded 0.70 and all AVE values were above 0.50, confirming internal consistency and convergent validity. The discriminant validity results also showed that the square roots of AVE were greater than the inter-construct correlations, indicating that each dimension captures a distinct aspect of ELSQ. These findings support the methodological appropriateness of the proposed scale and confirm that the seven dimensions are empirically distinguishable while still belonging to the broader logistics service quality domain.

From a contextual perspective, this study contributes to the literature by validating an ELSQ scale in a developing city rather than in a major metropolitan or developed-market setting. Previous research has cautioned that measurement scales developed in one context may not be directly applicable to another due to differences in infrastructure, culture, market maturity, and

customer expectations (Thai, 2013; Hair et al., 2019). The findings of this study confirm that some traditional LSQ dimensions remain relevant, such as timeliness, order condition, and order accuracy. At the same time, the results suggest that developing city contexts require additional attention to delivery accessibility, digital convenience, and return handling. Therefore, the proposed scale offers a more context-sensitive instrument for measuring e-commerce logistics service quality in emerging urban markets.

In summary, the findings indicate that e-commerce logistics service quality in Hue City is shaped by both operational performance and digital-service support. Customers evaluate logistics quality not only by whether products arrive on time and in good condition but also by whether delivery services are accessible, information is transparent, returns are convenient, and technology-enabled processes are secure and easy to use. This broader understanding is important for e-commerce platforms and logistics providers seeking to improve customer satisfaction in developing cities. By empirically validating the seven-dimensional ELSQ scale, this study provides a reliable measurement foundation for future research examining the effects of logistics service quality on customer satisfaction, loyalty, and repurchase intention in Vietnam and comparable emerging markets.

5. Conclusion

This study validated an E-commerce Logistics Service Quality (ELSQ) scale in the context of Hue City, Vietnam. Based on the literature on logistics service quality, e-service quality, and e-commerce logistics, the study proposed a seven-dimensional scale including Timeliness, Order Condition, Order Accuracy, Delivery Availability and Accessibility, Information Quality and Tracking, Return and Discrepancy Handling, and Technology, Security and Payment Convenience.

The empirical results confirm that the proposed scale has satisfactory reliability and validity. The EFA results supported a clear seven-factor structure, while the CFA results indicated good model fit. The values of Composite Reliability and Average Variance Extracted met the recommended thresholds, confirming convergent validity. Discriminant validity was also established, suggesting that the seven dimensions are distinct but collectively represent E-commerce Logistics Service Quality.

The findings contribute to the logistics and e-commerce literature by providing a validated measurement scale for a developing city context. Unlike studies conducted mainly in large metropolitan or developed markets, this research highlights the importance of context-specific logistics attributes such as delivery accessibility, tracking information, return handling, and technology-enabled service convenience.

From a practical perspective, the validated scale can help e-commerce platforms and logistics providers assess and improve service quality. Firms should focus not only on delivery speed, but also on accurate fulfillment, good product condition, transparent information, accessible delivery coverage, convenient return procedures, and secure payment-related processes.

This study has some limitations. The data were collected only in Hue City, which may limit generalizability. Future research should test the scale in other cities or compare different regional contexts in Vietnam. Further studies may also examine the effects of ELSQ on customer satisfaction, loyalty, trust, and repurchase intention.

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