EXPLORING THE RELATIONSHIP BETWEEN LOGISTICS SERVICE QUALITY IN LAST-MILE DELIVERY AND STUDENT SATISFACTION: A STUDY AT THE UNIVERSITY OF DANANG - UNIVERSITY OF ECONOMICS

Son-Tung Nguyen*, Hoai-Thuong Thi Pham, Anh-Thu Thi Vo, Nguyet-Phuong Ta

The University of Danang - University of Economics, Vietnam

*Corresponding author: tungns@due.edu.vn

Abstract - In recent years, Vietnam's e-commerce has achieved strong growth, averaging over 18% per year during the 2018–2023 period and projected to reach US$52 billion by 2025. In this context, last-mile delivery is considered a decisive factor in the overall customer experience. This study aims to develop an integrated model to assess the impact of logistics service quality on student satisfaction with last-mile delivery services, based on a case study at The University of Danang - University of Economics. Through the integration of approaches from SERVQUAL and ACSI, the study proposes a research model suitable for the local context, emphasizing core components including delivery time, accuracy, responsiveness, and information quality. The study's findings not only contribute to the theoretical foundation of logistics in emerging markets but also provide practical implications for businesses in meeting the increasingly high expectations of the young generation of customers.

Key words - Logistics service quality; last mile delivery; E-commerce; university students; Da Nang.

1. Introduction

The rapid expansion of commerce on digital platforms is driving profound changes in the core operations of the logistics industry. In particular, last-mile delivery - the final stage in the logistics supply chain, in which products are delivered directly to consumers - is regarded as a key determinant that directly affects customer experience and satisfaction, and simultaneously shapes firms' competitiveness and market position [1]. In Vietnam, the strong growth of the digital economy, supported by the pace of urbanization, the widespread diffusion of internet access, and the Government's strategies to upgrade logistics infrastructure, has fostered remarkable development in the online commerce market [2]. According to the Vietnam E-commerce Association, the sector maintained an average annual growth rate of over 18% from 2018 to 2023 and is projected to reach USD 52 billion by 2025 [3]. In this environment, logistics service quality (LSQ) in the final delivery stage is considered a decisive factor, not only in terms of operational performance such as transit time and order accuracy, but also with respect to perceived aspects such as timely problem handling, information accuracy, and the overall customer experience [4].

With the rapid development of online commerce in Vietnam, students - a young and adaptive customer group with frequent online shopping habits and high exposure to

delivery services - play an important role in the expansion of this market. In major cities such as Da Nang, an emerging economic and educational hub, students represent a consumer segment with high expectations for fast, convenient, and reliable delivery services [4]. Despite impressive growth, last-mile delivery in Vietnam continues to face substantial challenges, including complex traffic conditions, high population density in urban areas, and uneven adoption of logistics technologies [3]. These issues increase the burden on logistics service providers to meet increasingly stringent user expectations, particularly among student customers.

Although numerous service quality assessment models - most notably SERVQUAL and the American Customer Satisfaction Index (ACSI) - have been widely developed and applied globally, the majority were constructed within Western contexts, which differ significantly from Vietnam in terms of culture, technological environment, and infrastructure [4–8]. Moreover, most studies on LSQ in Vietnam remain at a general level, focusing primarily on mass-market customers, without an in-depth examination of students as a segment with substantial potential.

Based on the identified gaps in prior research, this study integrates elements of the SERVQUAL and ACSI models to develop a composite model, with the survey targeting students at The University of Danang - University of Economics (UD-DUE). By analyzing the factors affecting student satisfaction, the study contributes to extending and refining the theoretical framework of LSQ in developing markets, while proposing specific measures to optimize last-mile delivery quality. This, in turn, not only enhances user experience but also supports the sustainable growth of e-commerce in the context of Vietnam's digital transformation.

2. Theoretical background

2.1. The concept of Last-mile delivery (LMD)

Last-mile delivery (LMD) is the final stage in the logistics flow, in which products are transported from the last storage points (e.g., warehouses or logistics centers) directly to end consumers [10]. This is considered the most critical link in the overall logistics system, especially in the context of rapidly growing e-commerce, where delivery speed and service quality directly influence customer perceptions and satisfaction [8, 10].

LMD not only performs a transportation function but also serves as a key touchpoint between firms and

customers, thereby directly shaping consumers' perceptions of service standards [9]. Implementing a fast, accurate, and reliable delivery system can enhance trust and promote customer engagement [8]. In contrast, problems arising during the delivery process, such as delays or errors, may result in customer dissatisfaction and significantly diminish brand equity [10]. At the same time, LMD faces considerable pressure from external factors, including traffic congestion in major cities, high requirements for flexibility in delivery planning, and users' increasing expectations for delivery speed, such as same-day delivery or delivery within a few hours [9,10]. Under these conditions, firms are compelled to continuously optimize logistics operations and accelerate the adoption of modern technologies to improve operational efficiency and enhance the customer experience.

2.2. Logistics service quality and customer satisfaction

Logistics service quality (LSQ) plays a pivotal role in shaping customer satisfaction and long-term customer loyalty, especially in e-commerce [9]. LSQ can be understood as the degree of effectiveness in executing core logistics activities such as transportation, warehousing, and order processing, thereby reflecting the provider's ability to meet or exceed customer expectations [8]. According to Mentzer et al. [8], LSQ comprises two basic groups of factors: operational factors (e.g., transit time and order accuracy) and affective factors (including effective communication and provider empathy/understanding). Factors such as reliability, delivery speed, order accuracy, and after-sales support not only improve logistics performance but also deliver substantial benefits to customers, thereby strengthening firms' competitive position [8, 9].

To determine the impact of LSQ on user experience, assessing satisfaction is an essential step. Widely adopted metrics include the Customer Satisfaction Score (CSAT), Net Promoter Score (NPS), and Customer Effort Score (CES). CSAT emphasizes immediate feedback on specific details such as delivery time, but it lacks the ability to provide a comprehensive assessment of LSQ [4, 5, 11]. NPS evaluates customers' willingness to recommend the service, reflecting loyalty; however, it does not clarify specific operational aspects [6]. In contrast, the Customer Effort Score (CES) focuses on the level of effort customers expend when using a service, but it does not fully capture other key factors such as reliability or empathy [11]. The combined use of these indicators allows enterprises to strategically refine LSQ, thereby aligning more effectively with escalating customer expectations in the highly competitive landscape of e-commerce.

2.3. Factors affecting customer satisfaction

Service quality is commonly conceptualized as the discrepancy between customers' pre-service expectations and their post-service perceptions [7]. Accordingly, narrowing this gap is essential for enhancing service experiences and promoting sustained customer loyalty [7]. On this basis, models like ACSI and SERVQUAL have been extensively employed to examine the core relationship between service quality and customer satisfaction, due to their demonstrated empirical validity and practical relevance [5, 7].

2.3.1. The ACSI model

Developed for consumers in the United States, the ACSI model aims to evaluate satisfaction through three core variables: customer expectations, perceived quality, and perceived value [5]. Customer expectations represent predictions prior to using the service, whereas perceived quality reflects post-experience evaluations. Perceived value is calculated by comparing the benefits obtained (such as product quality or delivery performance) with the costs incurred, including both monetary and time costs [5]. ACSI has been shown to be a reliable measurement tool that enables effective prediction of customer attachment as well as business performance indicators. However, a limitation of the model is that it does not analyze service quality dimensions in detail, such as tangibles or reliability [5]. For example, in LMD, ACSI may indicate overall satisfaction levels but lacks the ability to identify specific causes of disappointment, such as late delivery or order errors.

2.3.2. The SERVQUAL model

SERVQUAL is widely recognized as the benchmark model for assessing service quality [7]. Parasuraman et al. developed this model based on five main components: tangibles, reliability, responsiveness, assurance, and empathy [7]. The model focuses on comparing customers' initial expectations with their actual perceptions after experiencing the service, thereby identifying quality gaps and suggesting areas for improvement to enhance service performance [7, 12]. Specifically:

(i) **Tangibles:** Physical elements such as equipment, employee appearance, and infrastructure, which create first impressions of service quality.

(ii) **Reliability:** The capability and consistency to deliver the service as promised; particularly important in logistics, where delivery accuracy and timeliness determine customer satisfaction.

(iii) **Responsiveness:** The speed and willingness to support customers, such as providing timely order-tracking information or rapidly resolving incidents that arise.

(iv) **Assurance:** Customers' confidence in the provider's competence and trustworthiness, based on staff expertise and professional attitudes.

(v) **Empathy:** The degree of care, attention, and ability to customize services, such as flexibly adjusting delivery times or handling specific requests.

Both ACSI and SERVQUAL indicate that customer satisfaction depends not only on directly measurable variables such as reliability or delivery speed, but is also influenced by affective factors such as empathy and assurance [7, 8]. In addition, perceived value also makes substantial contributions to shaping customer perceptions and loyalty [7, 12]. Enhancing these factors not only fosters customer satisfaction but also plays a strategic role in building long-term customer relationships and improving business performance in highly competitive environments like e-commerce.

Building on the theoretical foundations and existing

studies, the authors propose an integrated model to analyze the effects of service quality components, based on SERVQUAL framework, in combination with perceived value and customer expectations, on student satisfaction in the context of last-mile delivery in Vietnam (Figure 1). The proposed model not only emphasizes operational factors such as reliability and delivery speed but also incorporates affective factors such as empathy and assurance, thereby offering a comprehensive approach to improving students' experiences.
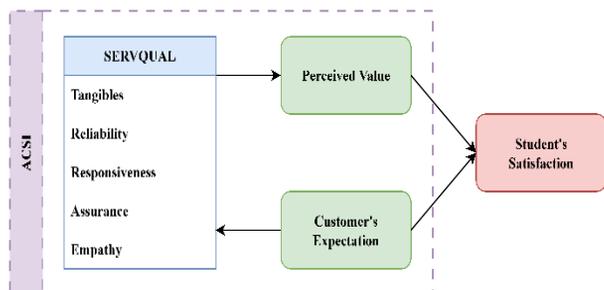

Figure 1. Proposed model

3. Methods and research design

3.1. Scale development

This study employs measurement scales derived from established and validated studies to evaluate the observed variables within the proposed framework. Specifically, the five SERVQUAL dimensions were measured using 21 items, following Parasuraman et al. [7], which are also employed to assess customer expectations. Perceived value was operationalized using 4 items, referenced from Fornell et al. [5]. Satisfaction was measured using three items, based on studies by Keiningham et al. [6] and Mentzer et al. [8].

Based on the selected measurement system, the questionnaire was designed with three main sections. The first section collected information on the e-commerce platforms frequently used by respondents, the delivery service providers, monthly online shopping frequency, and delivery locations, in order to capture online shopping behavior. The second section comprised 49 statements measured on a 7-point Likert scale (1 = strongly disagree; 7 = strongly agree) to evaluate the latent variables in the model. The final section gathered demographic data such as age, gender, monthly income, and other related factors.

To ensure linguistic accuracy and appropriateness of wording, the questionnaire was reviewed and revised by an expert panel consisting of one professor, two PhD holders, and two lecturers. Subsequently, a pilot survey was conducted with 30 students at the UD-DUE. Based on feedback, the questionnaire was refined and finalized to improve clarity and contextual suitability for the study.

3.2. Data collection procedure and analytical method

This study employed non-probability convenience sampling and conducted the survey from March to April 2025. The study sample comprised students enrolled at UD-DUE, to examine the relationships among service quality, expectation, perceived value, and student satisfaction in the last-mile delivery context. A total of 200

students - representing approximately 1.27% of the university's student population - were invited to participate in the study. After excluding incomplete responses, missing values, and outliers, 167 valid responses remained for use in the analysis and model testing. The demographic characteristics of the sample are presented in Table 1.

Table 1. Distribution of the Current Research Sample (n=167)

Criteria	Content	Frequence	%
Gender	Male	27	16.2
	Female	140	83.8
E-commerce Platform	Shopee	139	83.2
	Tiktok shop	27	16.2
	Lazada	01	0.6
Logistics providers	Shopee SPX Express	70	41.9
	J&T Express	56	33.5
	Giao hang tiet kiem	25	15.0
	Giao hang nhanh	12	7.2
	Viettel post	03	1.8
	Lazada Express	01	0.6
Received location	Home	156	93.4
	Work place/ School	10	6.0
	At the post office/ transaction point of the shipping unit	01	0.6
Frequence	1-3 times/ month	133	79.6
	4-6 times/ month	24	14.4
	Over 6 times per month	10	6.0

The study applied partial least squares structural equation modeling (PLS-SEM) to validate the relationships in the proposed model. According to Hair et al. [13], this approach is suitable for exploratory and theory-building research; therefore, it was selected for data analysis. This method supports the simultaneous analysis of complex relationships among variables while ensuring the assessment of reliability and validity of the results.

4. Results

4.1. Measurement model evaluation

Outer loadings are recommended to exceed 0.708 [13]. The analysis results show that all outer loadings of the observed indicators are above this threshold, indicating that the indicators adequately represent the constructs under investigation. In addition, reliability indices, including composite reliability rho_c, Cronbach's alpha and rho_a for each construct all exceed 0.70, thereby confirming the reliability of the measurement scales [13]. Regarding convergent validity, the average variance extracted (AVE) values for all constructs exceeded 0.50, indicating that the measurement scales met the criteria for convergent validity.

For discriminant validity, the study employed the Fornell-Larcker criterion, which requires that the square root of AVE for each construct be higher than its correlations with other constructs in the model. Moreover, the HTMT criterion was applied with a recommended threshold below 0.90 [14]. The results

show that most HTMT values are below 0.90; the only exception is the pair "tangibles" and "reliability," indicating a relatively high similarity between these two factors. In the last-mile delivery context, most activities occur at students' residences, where direct interaction with delivery staff becomes a key element. Therefore, students often perceive tangibles (particularly staff appearance) as an integral part of service reliability. These two constructs are closely related and mutually reinforcing, suggesting that combining them into a unified concept is reasonable.

Table 2. Scale Reliability Assessment

Code	Variable	Items	Factor loading	Cronbach's alpha	rho_a	rho_c	AVE
TA-E	Expected Tangibles	E1	0.812	0.799	0.829	0.882	0.713
		E2	0.814				
		E3	0.904				
REL-E	Expected Reliability	E4	0.919	0.944	0.945	0.960	0.857
		E5	0.915				
		E6	0.943				
		E7	0.925				
RES-E	Expected Responsiveness	E8	0.715	0.805	0.855	0.868	0.623
		E9	0.795				
		E10	0.817				
		E11	0.824				
AS-E	Expected Assurance	E12	0.881	0.821	0.821	0.893	0.737
		E13	0.894				
		E14	0.796				
EM-E	Expected Empathy	E18	0.752	0.860	0.877	0.905	0.706
		E19	0.892				
		E20	0.867				
		E21	0.842				
TA-P	Perceived Tangibles	P1	0.742	0.797	0.830	0.880	0.711
		P2	0.908				
		P3	0.871				
REL-P	Perceived Reliability	P4	0.872	0.925	0.926	0.947	0.817
		P5	0.942				
		P6	0.926				
		P7	0.873				
RES-P	Perceived Responsiveness	P8	0.709	0.849	0.874	0.899	0.690
		P9	0.870				
		P10	0.860				
		P11	0.873				
AS-P	Perceived Assurance	P12	0.921	0.864	0.863	0.917	0.788
		P13	0.911				
		P14	0.828				
EM-P	Perceived Empathy	P18	0.905	0.891	0.931	0.922	0.748
		P19	0.903				
		P20	0.895				
		P21	0.782				
CPV	Perceived Value	CPV1	0.863	0.823	0.868	0.881	0.651
		CPV2	0.720				
		CPV3	0.760				
		CPV4	0.874				
CS	Student's Satisfaction	CS1	0.929	0.878	0.923	0.924	0.801
		CS2	0.896				
		CS3	0.859				

Table 3. Re-evaluation of the Scale Reliability Assessment After Variable Merging

Code	Variable	Items	Factor loading	Cronbach's alpha	rho_a	rho_c	AVE
TR-E	Expected Tangibles & Reliability	E1	0.726	0.937	0.946	0.950	0.732
		E2	0.690				
		E3	0.923				
		E4	0.899				
		E5	0.911				
		E6	0.911				
		E7	0.896				
TR-P	Perceived Tangibles & Reliability	P1	0.608	0.926	0.937	0.942	0.701
		P2	0.829				
		P3	0.869				
		P4	0.878				
		P5	0.901				
		P6	0.910				
		P7	0.826				

Table 4. Assessment of the Discriminant Validity of HTMT

	AS-P	EM-P	TR-P	RES-P	CPV	AS-E	EM-E	TR-E	RES-E	CS
AS-P										
EM-P	0.309									
TR-P	0.749	0.124								
RES-P	0.387	0.798	0.132							
CPV	0.336	0.047	0.385	0.072						
AS-E	0.591	0.144	0.629	0.171	0.351					
EM-E	0.262	0.447	0.198	0.326	0.289	0.353				
TR-E	0.477	0.116	0.777	0.060	0.422	0.628	0.227			
RES-E	0.292	0.321	0.176	0.349	0.250	0.393	0.792	0.180		
CS	0.241	0.064	0.406	0.061	0.464	0.254	0.226	0.349	0.114	

Table 5. Multicollinearity test

	AS-P	EM-P	TR-P	RES-P	CPV	AS-E	EM-E	TR-E	RES-E	CS
AS-P					1.134					
EM-P					1.933					
TR-P										
RES-P					2.023					
CPV										1.221
AS-E	1.000									1.563
EM-E		1.000								1.828
TR-E			1.000							1.564
RES-E				1.000						1.823
CS										

When HTMT does not meet the recommended threshold, aggregating highly similar factors into a broader construct is a common approach [15]. Accordingly, merging "tangibles" and "reliability" into a composite construct is appropriate. After doing so, all measurement model evaluation indices meet the requirements (Table 3, Table 4), and reliability indices reach desirable levels, demonstrating strong robustness of the measurement scales used in this study.

4.2. Structural model assessment

4.2.1. Predictive power assessment

Multicollinearity was examined using the variance inflation factor (VIF) [13]. The results presented in Table 5 indicate that all VIF values are below the recommended

threshold, suggesting that the structural model does not suffer from multicollinearity.

Figure 2. *Model result*

The R² coefficient was used to evaluate the model's predictive accuracy, reflecting the extent to which the variance of the endogenous variable is explained by exogenous variables [13]. The results shown in Figure 2 indicate that the independent variables in the model explain 63.1% of the variance in the intention to use DBS.

4.2.2. Path relationships testing

Bootstrapping with 5,000 resamples was applied to assess the significance of the path coefficients β. A coefficient is considered statistically significant if the t-value exceeds the critical thresholds of 1.65, 1.96, and 2.57, corresponding to p-values of 10%, 5%, and 1%, respectively [14]. The analysis results indicate that all relationships in the model are supported at a minimum significance level of 1% in this study.

Table 6. *Structural path analysis results*

Relationship	Path coefficient	t-Value	P-Value	Decision
Direct effect				
Expectation → Perception	0.617	8.186	< 0.05	Accepted
Expectation → Student's Satisfaction	0.178	2.175	< 0.05	Accepted
Perception → Perceived value	0.284	2.711	< 0.05	Accepted
Perceived value → Student's Satisfaction	0.350	4.740	< 0.05	Accepted
Indirect effect				
Expectation → Perception → Perceived value → Student's Satisfaction	0.061	2.278	< 0.05	
Perception → Perceived value → Student's Satisfaction	0.100	2.761	< 0.05	
Expectation → Perception → Perceived value	0.175	2.304	< 0.05	

Table 6 presents the p-value results for each relationship in the model. The findings show that all relationships, both direct and indirect, have p-values below 0.05. This indicates that the relationships within the model are statistically significant, thereby confirming the appropriateness of the research model.

5. Discussion and conclusion

This study proposed and empirically validated a model for assessing logistics service quality in the last-mile delivery stage within the e-commerce sector in Vietnam, with a specific focus on students at UD-DUE. The findings not only reinforce contemporary theoretical frameworks on service quality but also offer nuanced insights into context-specific factors characterizing Vietnam's e-commerce environment, especially as they pertain to young and dynamic customer groups such as university students.

The results indicate that perceived value is the most important factor influencing student satisfaction (β = 0.350). This finding aligns with the ACSI framework, in which perceived value, which is defined by the balance between benefits received (on-time delivery, order accuracy) and costs incurred (time and money), plays a central role in shaping customer experience. For students, a price-sensitive segment that prioritizes convenience, factors such as reasonable delivery fees, fast delivery speed, and transparent order tracking were identified as key determinants of their satisfaction. In addition, satisfaction is directly affected by students' expectations; this factor also exerts an indirect effect through service quality perception and perceived value. This relationship suggests that students hold specific expectations regarding last-mile delivery services, such as on-time delivery, continuous tracking updates, and timely customer support when problems arise. When these expectations are met or exceeded, satisfaction increases substantially, consistent with prior studies by Parasuraman et al. [7].

Service quality perception also plays an important role in enhancing perceived value (β = 0.284), based on the five dimensions of the SERVQUAL model. Notably, the study found a high degree of similarity between tangibles and reliability, leading to the integration of these two dimensions into a composite construct. In the last-mile delivery context, students perceive the delivery staff's appearance and professional attitude (tangibles) together with the ability to deliver on time and deliver the correct order (reliability) as a unified concept. For example, a delivery worker who behaves professionally and ensures the correct product is delivered strengthens customer trust in the service, consistent with Mentzer et al. [8], who argue that operational and perceptual factors often complement each other. This is particularly important in Vietnam, where 93.4% of students in the sample receive deliveries at home, making direct interaction with delivery staff a core element shaping the overall experience.

Although the study achieved meaningful results, some limitations should be considered in future research. First, the sample includes only 167 students from a university, representing approximately 1.27% of the university's total student population, and therefore may not fully represent the broader target customer group. Second, the use of convenience (non-probability) sampling may introduce

sampling bias, thereby reducing the generalizability of the findings. Third, the study focuses exclusively on students, whereas other customer groups (such as office workers or older adults) may have different expectations and perceptions of logistics service quality. Finally, the study did not examine the effects of emerging technologies, such as artificial intelligence applications, which are becoming prominent trends in the logistics industry.

Future studies should expand the sample size and include more diverse customer groups (e.g., office workers, older adults) and different geographic areas (urban and rural) to test the robustness of the LSQ model. Integrating technological factors, such as the application of artificial intelligence to optimize routing or automate handover processes, should also be explored to assess their effects on service quality. In addition, comparisons among logistics service providers (e.g., Shopee SPX Express, J&T Express) or among e-commerce platforms (e.g., Shopee, TikTok Shop) may help uncover differences in customer experience and service performance.

In conclusion, this study successfully developed and validated an integrated LSQ model that combines the SERVQUAL and ACSI theoretical frameworks to assess last-mile delivery service quality in Vietnam's e-commerce sector. The findings not only enrich the theoretical foundation of service quality in developing markets but also offer practical recommendations to help logistics service providers optimize their operations and better meet customer expectations, particularly those of the student segment.

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