FACTORS AFFECTING E-COMMERCE DELIVERY PERFORMANCE IN HO CHI MINH CITY

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Abstract: ***The rapid development of e-commerce in Vietnam has significantly increased the demand for efficient delivery services, particularly in major urban areas such as Ho Chi Minh City. The study examines the factors influencing e-commerce delivery services in the city. Based on a survey of 232 respondents, including students, workers, and delivery staff in Ho Chi Minh City, the study aims to identify the key factors affecting delivery operations in the e-commerce sector. The findings provide empirical evidence on the main factors influencing delivery performance in e-commerce. These results offer useful implications for businesses and policymakers in improving logistics efficiency and enhancing customer satisfaction in the digital marketplace.***

• Keywords: *e-commerce, delivery of goods, Ho Chi Minh City.*

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Introduction

Ho Chi Minh City is Vietnam's largest commercial hub, accounting for a major share of the country's online orders. Studies emphasize the city's advanced but strained logistics system. Phin et al. (2024) describe Ho Chi Minh City as having the most important logistics role in southern Vietnam, and note that a municipal Logistics Development Plan (to 2025) underscores the need to integrate e-commerce and logistics operations. However, they find that "a model to connect e-logistics… has not been formed yet," meaning that e-commerce and logistics businesses often work in parallel rather than in a coordinated chain. As a result, delivery processes are fragmented and inefficient. In summary, while the city's logistics infrastructure is relatively advanced, physical constraints and coordination gaps still limit delivery performance. This creates an urgent practical need to study and improve e-commerce delivery operations in the city.

Despite the practical importance, academic research on Vietnam's e-commerce delivery is still sparse. As Phin et al. (2024) observe, studies on factors affecting e-logistics in Vietnam are "relatively few". In particular, no comprehensive strategic model for Vietnam's e-logistics has been formulated. Most existing studies have tended to focus on customer satisfaction or high-level market trends, rather than systematically analyzing the operational factors that influence delivery performance (Gajewska and Zimon, 2018). This gap presents clear research opportunities. A detailed factor analysis of Ho Chi Minh City's e-commerce delivery operations can fill a theoretical void by identifying locally relevant issues and relating them to established logistics theories. In short, there is an urgent need for research that explicitly links Vietnam's e-commerce delivery practices with academic logistics models, thereby providing both practical guidance and theoretical advancement.

Hypothesis development

Based on the synthesis of the literature, specific causal links between the identified operational factors and delivery performance are established, leading to the formation of six formal hypotheses.

Numerous studies empirically confirm that traffic delays harm delivery performance. A global industry report projects that, if unchecked, urban deliveries could add an extra five minutes to the average commute by 2030 - a proxy for delivery vehicles spending far more time on the road (Sustainability Directory, 2025). Increased congestion means couriers sit idle or take longer routes, directly reducing the number of on-time deliveries per day. In Vietnam, Nguyen et al., (2023) found that driver fatigue and roadblocks during lockdowns caused notable delivery slowdowns. Thus, the authors propose the hypothesize:

H1: Higher traffic congestion and poor urban infrastructure are associated with lower delivery performance and longer lead times.

Empirical data show that rising operating costs constrain delivery performance. For instance, a McKinsey survey found that fuel and utility costs have surged above inflation in recent years, while logistics providers struggle to retain staff (Gosling, 2025). When

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costs go up, providers may cut routes, raise prices, or reduce service levels, which can lengthen delivery times or reduce frequency. Quantitative studies often link high shipping costs to decreased order volumes and repeat purchases (IBRAHIM, 2025), suggesting that expensive delivery directly hurts business. In Vietnam, the new truck driving limits compelled carriers to hire more drivers and pay higher wages, with over half reporting up to 10% cost increases and significant delivery delays (Vietnam Logistics Consultant, 2024). All else equal, higher cost-per-delivery is likely to slow carriers or force them to consolidate shipments, reducing speed. Therefore, the authors propose the hypothesize:

H2: Higher operational costs (e.g. fuel, labor) and reduced workforce availability will worsen delivery performance (slower, less reliable deliveries).

Studies consistently find that technology improvements boost delivery outcomes. For example, advanced routing algorithms and real-time tracking have been shown to increase on-time rates and reduce transport miles. In one controlled trial, introducing AI-based dynamic routing with electric vans cut delivery time by ~20% (Sustainability Directory, 2025). Thus, greater use of logistics technology should correlate with higher delivery speed and reliability. The hypothesis is proposed:

H3: Greater application of modern delivery technologies (e.g. tracking, automation, alternative vehicles) improves delivery performance (faster and more predictable deliveries).

The impact of regulations on delivery is often documented. For example, studies of hours-of-service rules in trucking find that stricter driving limits inevitably lengthen transit times and reduce utilization efficiency. The Vietnamese case of Decree 168/2024 provides concrete data: after limits were enforced, two-thirds of shippers reported delivery time increases (>10%), and on-time rates fell (fewer firms maintained 70-89% punctuality) (Vietnam Logistics Consultant, 2024). Similarly, compliance with emissions or noise rules (common in some cities) forces companies to invest in cleaner fleets or accept restricted time windows, which may lower productivity. We thus propose:

H4: Stricter or poorly coordinated regulations (e.g. tight driving limits, restrictive zones) have a negative effect on delivery operations, whereas supportive policies (e.g. infrastructure investment) can mitigate delays.

Empirical analyses suggest that better coordination raises efficiency. Cases where multiple carriers or retailers coordinate demonstrate gains. Although few formal studies quantify this directly, related research on supply chain collaboration shows that integrated information systems (linking e-commerce orders to courier routing) improve fill rates and speed. Anecdotal evidence from combined logistics services indicates fewer missed deliveries and higher capacity utilization. The hypothesis is proposed:

H5: Greater cooperation and integration between e-commerce platforms and logistics providers leads to smoother, faster deliveries (higher fill rates and on-time rates).

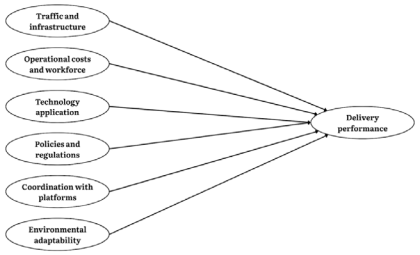
External shocks and environmental considerations can significantly perturb delivery outcomes. Empirical work on COVID-19's impact (e.g. in Vietnam) finds that lockdowns not only shifted demand patterns but also imposed mobility constraints that lengthened delivery cycles. Similarly, fuel price spikes (often due to global events) have been correlated with carriers reducing service levels or increasing fees, which can delay shipments. From an urban planning perspective, rising environmental pressures may lead to new restrictions on delivery vehicles; studies note that last-mile deliveries can account for ~13% of a city's transport emissions (Sustainability Directory, 2025), highlighting why cities might enforce green measures. While not always parameterized in single models, we posit:

H6: Negative external events (e.g. sharp fuel price rises, extreme weather, pandemics) degrade delivery performance, as do stricter environmental policies that limit delivery operations.

Proposed research model

Based on the above literature, we propose a conceptual research model where six groups of factors influence e-commerce delivery performance in Ho Chi Minh City. The dependent variable, Delivery performance, is measured by outcomes such as on-time delivery rate, average delivery time and delivery cost per order. The independent factors are Traffic congestion (TC), Operating costs (OC), Technology application (TA), Policies/regulations (PR), Coordination between logistics units and e-commerce platforms (CO), and External environment (EE). Each of these dimensions is drawn from the literature review above. The model is proposed as:

Figure: Proposed research model



Source: Composed by the author

Each hypothesized link derives from the reviewed theory and evidence above (H1-H6). The proposed model will be tested (e.g. via regression) using data from e-commerce businesses and delivery providers in Ho Chi Minh City.

Research methodology

This research was conducted using the method of analysis and synthesis to build a theoretical basis and interpret the results. During the implementation process, the main research method was Quantitative Research through social survey techniques. The topic used the sociological investigation method with the survey subjects being e-commerce consumers, students, professionals and shippers in Ho Chi Minh City, the sample size was N=232 valid samples, the sampling method was non-probability convenience. The collected data was processed using SPSS software program.

Research results

Assess the reliability of the scale using Cronbach's Alpha coefficient

Table 1: Results of Cronbach's Alpha reliability test of factors in the research model

Observation variables	Scale average if variable is excluded	Scale variance if variable is eliminated	Variable-total correlation	Cronbach's Alpha if variable is excluded
Traffic Congestion Factor: Cronbach's alpha = 0.896				
Operating Cost Factor: Cronbach's alpha = 0.841				
Technology Application Factor: Cronbach's alpha = 0.888				
Policy/Regulation Factor: Cronbach's alpha = 0.923				
Factor Coordination between logistics units and e-commerce platforms Cronbach's alpha = 0.872				
External Environment Factor: Cronbach's alpha = 0.896				
Delivery Performance Factor: Cronbach's alpha = 0.875				

Source: Analysis results from SPSS software

The results of the reliability analysis of the scale using Cronbach's Alpha coefficient in Table 1 show that all seven factors in the research model all have Cronbach's Alpha values greater than 0.7. This proves that the measurement statements built in the questionnaire have relatively accurately reflected the content of each research concept. In addition, all observed variables have a Corrected Item-Total Correlation coefficient greater than 0.3, indicating that these variables are closely correlated with the total score of the scale, and no variable was removed from the model due to violating the reliability criterion.

Exploratory factor analysis (EFA)

Exploratory factor analysis EFA for independent variables

The results of exploratory factor analysis (EFA) for independent variables show that the survey data fully meets the conditions for performing EFA. Specifically, the Kaiser-Meyer-Olkin (KMO) coefficient = 0.825, ranging from 0.5 to 1.0, demonstrating that the correlation between observed variables is high enough to conduct factor analysis. At the same time, Bartlett's Test of Sphericity has a value of Sig. = 0.000 (< 0.05), showing that the data set is completely suitable for extracting latent factors.

The results also show that the Eigenvalues of the factors are all greater than 1, in which the lowest factor has Eigenvalue = 1.569, proving that each factor has the ability to significantly explain the variance of the data set. At the same time, the total variance extracted reached 78.125%, far exceeding the 50% threshold recommended by Hair et al. (2010), which shows that the 6 extracted factors can explain up to 78.125% of the variation in the data - a high level, reflecting a measurement model with good fit and explanatory ability.

In addition, all observed variables have factor loading coefficients (Factor Loading) > 0.5, ensuring that the observed variables have a close relationship with the factors they represent. No variables are eliminated or grouped incorrectly, demonstrating that the convergence and differentiation of factors in the model are clear and consistent.

Exploratory factor analysis EFA for dependent variable

Through the results of exploratory factor analysis (EFA) for the dependent variable - Delivery performance, it can be seen that the data is completely suitable for conducting factor analysis. Specifically, the KMO coefficient = 0.805 (ranging from 0.5 to 1) shows that the appropriate level of data meets the requirements. At the same time, the Sig. value of Bartlett's Test = 0.000 (< 0.05) proves that the observed variables are closely correlated with each other in the whole, so conducting EFA is necessary and reasonable.

The EFA results show that, at Eigenvalue = 3.341, a single factor was extracted from five observed variables of the dependent variable "Delivery performance". The total variance extracted reached 66.815%, meaning that this factor explained 66.815% of the variation in the data set - a high level, reflecting the concentration and consistency of observed variables in measuring the same concept.

Linear regression model

Assessing the explanatory power of variables in the model and testing for multiple autocorrelation

Table 2: Baseline values of the model and autocorrelation test

Correlation coefficient	Coefficient of determination	Correction coefficient of determination	Estimated error	Durbin-Watson test
0.710	0.504	0.49	0.5187	1.554

Source: Analysis results from SPSS software

The linear regression results in Table 2 provides basic parameters to evaluate the suitability of the research model, and at the same time test the autocorrelation

phenomenon through the Durbin-Watson index.

First of all, the correlation coefficient (R) of the model reached 0.710, showing a fairly close relationship between the dependent variable and the independent variables. This value is greater than 0.5, demonstrating that the relationship between delivery performance and influencing factors is relatively strong, reflecting that the independent variables in the model play an important role in explaining the variation of delivery performance in practice.

Next, the coefficient of determination (R^2) reached 0.504, meaning that about 50.4% of the variation in delivery performance can be explained by the six independent factors in the model. In other words, half of the variation in delivery performance between the surveyed subjects can be explained by factors such as transport infrastructure, operating costs or the level of technology application.

In addition, the Durbin-Watson test shows that the test value = 1.554, ranging from 1 to 3, indicating that the model does not have residual autocorrelation.

Assessing the impact of independent variables

Table 3: Linear regression results and multicollinearity test

	Unstandardized regression coefficients		Standardized regression coefficients	t	Sig.	Multicollinearity test	
	Regression coefficient	Standard error	Regression coefficient			Tolerance	VIF
Constant	4,847	0.329		14,753	0		
TC	-0.302	0.05	-0.336	-6.078	0	0.72	1.389
OC	-0.241	0.052	-0.222	-4.655	0	0.966	1.035
TA	0.109	0.038	0.142	2,853	0.005	0.893	1.119
PR	-0.1	0.037	-0.135	-2.687	0.008	0.876	1.142
CO	0.138	0.046	0.165	2,983	0.003	0.721	1.388
EE	-0.184	0.047	-0.204	-3.906	0	0.809	1.236

Source: Analysis results from SPSS software

Table 3 presents the results of multiple linear regression between the dependent variable Delivery performance (DP) and six independent variables including Traffic congestion (TC), Operating costs (OC), Technology application (TA), Policies/regulations (PR), Coordination between logistics units and e-commerce platforms (CO), and External environment (EE).

With the estimated unstandardized regression coefficients, the regression model takes the form:

$$DP = 4.847 - 0.302*TC - 0.241*OC + 0.109*TA - 0.100*PR + 0.138*CO - 0.184*EE$$

The test results show that all independent variables in the model have Sig. values less than 0.05, proving that they are statistically significant and have a significant impact on delivery performance. However, the direction of impact of each factor is different, specifically as follows:

Traffic congestion (TC) has a regression coefficient of -0.302, which is negative and significant at Sig. = 0.000.

Operating costs (OC) also have a negative coefficient (-0.241, Sig. = 0.000), indicating that high operating costs, including fuel, labor, and vehicle maintenance, reduce delivery performance.

Technology application (TA) has a positive coefficient (0.109, Sig. = 0.005), indicating that higher levels of technology adoption significantly improve delivery performance.

Policies/Regulations (PR) have a negative regression coefficient (-0.100, Sig. = 0.008), reflecting those restrictive regulations such as truck ban hours, intra-city transportation fees or complicated administrative procedures can reduce delivery performance.

The coefficient of coordination between logistics units and e-commerce platforms (CO) is positive (0.138, Sig. = 0.003), indicating that effective coordination between the two parties helps improve quality and reliability in the delivery process

External Environment (EE) has a negative coefficient (-0.184, Sig. = 0.000), indicating that external factors such as weather, fuel price fluctuations, or local policy changes can negatively affect delivery performance.

Research conclusion and recommendations

Conclusion

Reliability analysis and factor analysis identified six main groups of factors, including Traffic congestion (TC), Operating costs (OC), Technology application (TA), Policies/regulations (PR), Coordination between logistics units and e-commerce platforms (CO), and External environment (EE).

Managerial implications

Traffic congestion

A suitable and fundamental solution to reduce the impact of traffic congestion on e-commerce delivery activities in Ho Chi Minh City is to upgrade and re-plan the traffic infrastructure system. In addition, concentrated delivery areas need to be clearly planned, allowing small trucks or pickup trucks to have legal parking areas for short periods of time to reduce spontaneous deliveries that obstruct traffic. This solution requires large resources and long-term construction time, but brings sustainable benefits such as reducing travel time, limiting vehicle damage, saving fuel and significantly improving the smoothness of delivery operations in the city.

Operating costs

In terms of cost and human resources, the optimal solution at the current stage is to optimize operating costs

through process improvement and semi-automation. Enterprises can invest in automatic sorting equipment, high-capacity barcode scanners and conveyor systems to reduce manual labor in the warehouse. In parallel, restructuring the warehouse floor plan, such as arranging the picking area near the shipping area, setting up a "one-way flow" to reduce intersections, will help shorten order processing time. At the delivery stage, enterprises can deploy a model of sharing transportation resources with other units to take advantage of empty vehicles turning around or reduce the number of empty vehicles moving. The implementation process can be done within three to nine months depending on the scale. By operating more optimally, businesses can reduce labor costs, shorten processing times and reduce errors in product classification, thereby improving delivery performance without having to rely too much on seasonal labor, which is unstable in the long term.

Technology application

In the technology group, a sustainable solution that is in line with the green logistics development trend is to apply environmentally friendly delivery vehicles combined with a data analysis system. Enterprises can start by converting a part of their fleet to electric motorbikes or electric trucks, and installing mini charging stations at warehouses or collection points. The pilot phase of 20-50 electric vehicles in the first phase helps enterprises evaluate operating costs, battery life, power consumption and transportation efficiency. At the same time, enterprises build a data analysis system to forecast demand, identify areas with high risk of failed deliveries and optimize routes based on real-time data. This solution brings many benefits: significantly reducing fuel costs, limiting risks due to fluctuating gasoline prices, increasing the speed of delivery planning and improving brand image in a modern, sustainable and environmentally friendly direction.

Policies and regulations

One of effective solutions for the policy factor is to establish a regular dialogue mechanism between logistics enterprises, industry associations and management agencies to propose adjustments to regulations that hinder delivery activities. Enterprises can establish a legal team to coordinate with the Vietnam Logistics Enterprises Association (VLA) to synthesize problems, conduct impact surveys of new regulations, and then present proposed adjustments to the Department of Transport or the Ho Chi Minh City People's Committee. Special meetings, policy discussions or joint working groups can be organized quarterly to ensure a two-way flow of information. The implementation roadmap can last from 6 to 12 months depending on the level of adjustment. When policies are improved in a more flexible direction, delivery activities become smoother, reducing delivery delays due to complex compliance requirements and reducing costs for businesses.

Coordination between logistics units and e-commerce platforms

In the context of the interoperability API that has been deployed by many units, a suitable alternative solution is to develop a network of PUDO (Pick-Up and Drop-Off) points and smart lockers in residential areas and commercial centers. Logistics enterprises can cooperate with apartment management boards or large supermarket chains to install automatic lockers where customers can pick up or return goods at any time without having to meet the driver directly. The implementation process includes investing in a locker system with security software connection, integrating QR codes and setting up optimal routes so that drivers can deliver in batches instead of individually.

External environment

A suitable solution for the environmental adaptation factor is to switch to green delivery vehicles, especially in the context of Ho Chi Minh City often facing air pollution, erratic weather and emission reduction requirements. The implementation process can start with businesses testing electric or hybrid vehicles on fixed routes with short distances, avoiding flooding and having suitable infrastructure. Delivery staff are trained in operating techniques and troubleshooting related to electric vehicles. After a six-month testing period, businesses evaluate the fuel cost savings, durability and long-distance efficiency of the vehicles to consider expansion. This solution not only helps businesses maintain stable operations even when the source of gasoline and oil fluctuates, but also helps the city achieve green development goals, while creating a competitive advantage for businesses in the eyes of customers and partners.

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