Evaluating the Selection Factors for Vietnamese Last-Mile Delivery Service Providers using Best Worst Method

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***Abstract*— Recent trends in supply chain show that last mile delivery is one of the fastest growing segments in logistics yet, it remains one the most challenging ones in terms of reliability, cost, and consumers' requirements. This study aims to identify the factors directly affecting the competitiveness of logistics companies providing last-mile delivery service under a consumers' perspective. The study employs a best-worst method (BWM) to assess which alternative and which criteria are the preferred ones when selecting a last-mile service provider in Vietnam. The selected criteria include shipping cost, lead-time, customer service, insurance policy and delivery liability, and the alternative are three last-mile service providers namely GHN, GHTK, J&T, the largest logistics companies operating in Vietnam. The study findings reveal that GHTK company is the most competitive last-mile service provider compared to the others due to outstanding intrinsic characteristics and competitive advantage. In particular, the findings of the paper show that customer value "Delivery cost" as the most important criterion in domestic last-mile delivery whilst "Customer Service" is the least important one in the Vietnamese market.**

***Keywords*—** *Last-Mile Delivery, Logistic Service Providers, Customers' Requirements, Best-Worst Method.*

1. Introduction

Logistics plays a vital role in the transportation of goods, especially in the fast-moving consumer goods (FMCG) industry. Along with the recent strong growth of E-Commerce and Omnichannel and the need for business-to-customer (B2C), customer-to-customer (C2C) and small retailers to consumers, consumers are increasingly demanding the delivery of goods as they expect a seamless experience from ordering to receiving goods. If the delivery process is disrupted at any stages, it will most likely result in a bad customer experience. Thus, it will affect the competitiveness of businesses [1]. Furthermore, the customer's first impression of the product will influence a customer's future purchase potential [2]. The proper selection of service elements amongst different last-mile companies like a reliable service ensuring the quality of goods at a reasonable cos is a crucial step and directly affects the quality of the product to the end consumers and the profit of the company or retailers [3].

Last-mile delivery is defined as the last leg in the transportation of a consignment in supply chain from last dispatch point to the delivery point where the consignee receives the consignment [4]. Due to the convenience and speed of online shopping, most consumers are becoming more and more inclined to buy online and receive goods delivered to their houses instead of having to spend a lot of time buying directly at stores. Online shopping today is considered as one of the ways of entertainment and self-satisfaction, and home delivery is one of the leading solutions to help increase revenue for the company and also the connection between customers and sellers. Unlike large-scale shipping, a large number of products will not be sent to the same destination. Instead, drivers deliver

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many smaller packages, each with its own destination. As a result, last-mile deliveries are more challenging due to more complex routes and maintenance of a larger fleet of drivers to transport small amounts of products. Yet, last-mile distribution causes several challenges to urban centers including pollution, congestion and an overall negative health impact for the population [5] and these issues are likely to worsen in the next years [6]. Nevertheless, it is estimated that last-mile delivery account for 53% of total transport costs and 39% of customers is ready to change suppliers if they are not satisfied with the service [7]. Furthermore, the desire for same-day or next-day delivery or the right to return the item (free of charge) is also an important element to considered by providers. Moreover, shipping cost and lead time are also two main factors customers consider the most when choosing a reputable last-mile delivery company.

As a developing country, Vietnam's last-mile delivery service providers face several challenges which include congested urban centers and relatively undeveloped national infrastructures. Furthermore, the most utilized freight transport mode in Vietnam is primarily represented by motorbikes, which can only carry small and light parcels due to terrain and infrastructural constraints. The delivery and receipt of goods to customers at the earliest, especially same-day delivery or next-day delivery for goods from the North to the South of Vietnam is always a big challenge for last-mile delivery companies in Vietnam.

The originality of this paper lies in the application of the Best Worst method (BWM) to evaluate the selection of last-mile delivery companies (Giaohangtietkiem (GHTK), GHN (Giaohangnhanh), J&T Express) in a specific context (Vietnam) according to 5 criteria listed as follows: delivery costs, lead time, customer service, insurance and delivery liability. The findings of the study can support logistics companies in Vietnam to understand the major customers' requirements in a highly competitive market for last mile delivery and take managerial action for improvements in order to build competitive advantage and enhance customer satisfaction.

Hence, this study has a twofold objective: (i) to compare service factors between last-mile companies in Vietnam based on the collected data (ii) to determine which factors are the most and least important for last-mile delivery if the selected logistics companies in Vietnam. The reminder of the study is as follow: section 2 will present a literature review of the topic and the rationale for the selection of criteria; section 3 shows the research methodology; section 4 the results and section 5 conclude the study suggesting potential implications and limitations.

2. Literature Review

The literature review has been conducted under 2 main sub areas as: (i) Current situation of last-mile delivery and the chosen alternatives for selecting last-mile delivery companies in Vietnam; and (ii) factors affecting the decisions of choosing last-mile delivery partners.

2.1 The current situation of last-mile delivery in Vietnam

Globally and in Vietnam alike, businesses in the logistics ecosystem are racing to develop technologies and test new supply chain models to accelerate goods delivery and increase customer satisfaction. Last-mile delivery is therefore one of the potential keys to the success of Vietnam's e-commerce industry. According to [2], the most significant impact of IR 4.0 in Vietnam is the steady development of e-commerce. Vietnam currently has one of the fastest-growing B2C ecommerce markets in Southeast Asia and Based on the Department of E-commerce and Information Technology, the turnover of e-Commerce in Vietnam in 2016 reached approximately $5 billion, an increase of 20% compared to 2015 and accounting for about 4% of nationwide total retail sales [8]. According to a report by Ken Research, Vietnam E-commerce logistics market value was reported to be 90 million Euro in 2018 and projected to grow at an annual rate of 42% per year till 2022 [9]. The current booming of Vietnam e-commerce, therefore, has created very high demand and pressure for logistics services as well as triggered a promising e-logistics sector, particularly last-mile logistics.

According to [10], there are four trends occurring in the last-mile delivery in Vietnam and applied by e-Commerce companies as follow:

a. B&M store and home delivery (by in-house shipping team): Big B2C e-Commerce merchandise (such as thegioididong, dienmayxanh, FPTshop and Nguyen Kim) process fulfillment by themselves. In most cases, B2C companies have their own chain of B&M stores in many provinces or even nationwide. Thus, once an order is placed, products will be sent to their retail stores for customers to pick up by themselves, or the retailer's delivery team will bring the parcel directly to their doorstep.

b. Attended home delivery (by in-house departments): Some B2B and B2C websites (namely Lazada and Tiki) also cover the order fulfillment. However, the difference is that they neither have physical stores nor offer pick-up services. Such companies develop their own fulfillment process including warehousing, packaging and shipping. They will be in charge of picking products from sellers, storing, re-packing and delivering the parcels to buyers.

c. Attended home delivery (by 3PL providers): Other B2B and B2C websites (such as Sendo) and C2C platforms (such as Vatgia) provide delivery services through its shipping partners. They only act as an intermediate marketplace and supervise the fulfillment process.

d. Attended home delivery (by both in-house team and 3PL providers): Shopee is applying this method in their operations. They have both in-house teams called Shopee Express and 3PL partners such as Giaohangtietkiem, Giaohangnhanh and J&T Express to fulfill a massive volume of orders every day.

Based on the following trends, three of the largest logistics companies operating in Vietnam which are involved in last –mile delivery services were selected. The three selected companies are listed and described as follow:

2.1.1. Giaohangtietkiem (GHTK)

GHTK can be considered as a top player in the Vietnamese logistics market. The company is a highly reputable and reliable brand for Vietnamese consumers as it provides good customer service, a professional website system that meets standards and more importantly, its shipping fee is quite low compared to the market floor price. Besides these outstanding points, there is still an inadequacy when approaching the service of GHTK, which is the receipt of orders process. The company only receives orders directly through the website, online app or API (Application Programming Interface), which is quite inconvenient for some customers [11].

2.1.2. Giaohangnhanh Express (GHN)

GHN is one of the top popular companies which provide a fast delivery service in Vietnam. With regard to operational methods as well as the speed of shipping, the company has provided a quite fast and thoughtful service, covering 63 provinces and cities across Vietnam. GHN's mission is to bring a 5-star standard experience and giving customers the most satisfaction and satisfaction, a flexible operation and operation process of fast delivery service has been formed. Keeping up with the current development trend, express delivery service has upgraded its service to a new level with the addition of a 60-minute delivery service for fastidious customers who need fast delivery and for specific orders that need to be delivered in a time-constraint. Three biggest advantages of this company are: Fast delivery, serviceable website system and compensation in case of damaged goods [12].

2.1.3. J&T Express (J&T)

J&T Express is a multi-country express delivery brand based on Internet technology. The services J&T Express offers include domestic, international express and services for online business. Good transport quality, wide scope of service provision and insurance policy are the strengths of this company. However, the high shipping cost of COD service and the long transit time between the south and the north or between the non-centre cities are the limitations of this shipping provider [13].

2.2. Factors affecting the selection of last-mile service-providers

Consumers weigh the benefits against the costs of each logistical channel, such as convenience and time savings [14]. Therefore, it is very useful to identify and understand variables that could affect customers' behaviours when selecting last-mile delivery service providers. Since the logistics service market in general and last-mile logistics, and in particular in Vietnam, is forecasted to witness a rapid scale expansion, in order to improve competitiveness for service providers it is worthwhile to review the main influencing factors from a customers' perspective. [1] has highlighted the fact that an enterprise needs to ensure two factors: efficiency and effectiveness. This means getting the job done at the lowest possible cost and creating the most value for the customer. In other words, the performance of last-mile delivery carriers is an influential factor to customers' selection behaviours.

According to [15] customers tend to demand faster deliveries and increased delivery schedule reliability. [16] reported that the three elements of customer satisfaction are delivery convenience, speed of delivery and delivery reliability. Delivery speed, or delivery time, is described as the time between order fulfilment and the physical delivery of the product to the customer [17]. Delivery reliability is defined as the ability to meet exactly quoted or anticipated delivery dates and quantities and is considered to be an essential element of service quality [18] and is closely linked to customer benefits and losses [19]. In fact, reliability is also considered as an essential element for customer satisfaction as late arrivals of orders can cause customer dissatisfaction [20]. Similarly, a survey was conducted to assess consumers' delivery expectations when shopping online. It was found that 62% of respondents are less likely to make a shopping decision if an item is not delivered within two days of the committed date. In particular, 68% of respondents indicated their expectations for on-time delivery were higher during the festive season. Also, 59% of respondents said they would have desisted shopping with a retailer if they had received two to three incorrect shipments; 55% of respondents will stop shopping from a retailer after 2-3 late deliveries [1]. However, in some cases, consumers perceive shipping fee as the only cost of fulfillment and they are more sensitive to shipping fees than to the product price [21]. Furthermore, the authors identified that 92% of American buyers are willing to wait

more than four days for free shipping, indicating that free shipping is highly valued.

Based on the literature review and a discussion with logistics experts, five main criteria were identified and selected for evaluating the competitiveness of last-mile service providers. The descriptions and references of each criterion are provided in table 1.

Table 1. Criteria Selection for last-mile delivery Service Providers

Criteria	Description	References
(1) Shipping cost	The fees that customers have to pay for the shipping service to ship their products to the required destination.	[22], [23], [24]
(2) Lead-time	The time between order fulfillment and delivery to a customer.	[17], [25], [26], [27]
(3) Customer service	The attitude and attention of the staffs' company or the delivery man to the customer.	[25], [23], [28]
(4) Insurance policy	The guarantee of the safety of the goods for customers.	[29], [30], [31], [32]
(5) Delivery reliability	The ability to meet exactly quoted or anticipated delivery dates and quantities.	[33], [33], [18]

3. Research Methodology

3.1. Best Worst Method (BMW)

The Best Worst method (BWM) is a multi-criteria decision-making method (MCDM), which was first introduced in 2015 by Dr.Jafar Rezaei [35]. It is a method based on systematic pairwise comparison of decision criteria that evaluates a set of alternatives. From there the best criterion and the worst criterion are determined by the decision maker [36].
The BWM consists of 6 steps to determine the weight.

Step 1: Formulation of the problem
Step 2: Find the best and the worst criterion
Step 3: Find the preference of the best criterion of all
Step 4: Find the preference of the worst criterion of all
Step 5: Estimate optimal weights
Step 6: Final scores of alternatives

In the past, there are some previous papers which applied BWM such as:
•A supplier selection life cycle approach integrating traditional and environmental criteria using the best worst method [37].
•Measuring the relative importance of the logistics performance index indicators using Best Worst Method [38].
•Assessing the social sustainability of supply chains using Best Worst Method [39].

In this article, for the purpose of comparing alternatives and criterion, we can also use the AHP method (a pairwise comparison method). However, compared to the AHP method, BWM performs better in terms of consistency ratio and evaluation criteria such as: minimum violation, total deviation, and compliance. Besides, BWM also has outstanding features such as: (1) It requires less comparative data; (2) it leads to more consistent comparisons, which means it produces more reliable results [35].
The issue considered in this study is a multi-criteria decision problem analysis (MCDA) can be represented by a matrix in Equation as follow [36]:

$$A = \begin{array}{c} \\ a_1 \\ a_2 \\ \vdots \\ a_m \end{array} \begin{array}{c} \begin{array}{cccc} c_1 & c_2 & \cdots & c_n \end{array} \\ \begin{pmatrix} p_{11} & p_{12} & \cdots & p_{1n} \\ p_{21} & p_{22} & \cdots & p_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ p_{m1} & p_{m2} & \cdots & p_{mn} \end{pmatrix} \end{array}$$

In the matrix above, the top row $\{c_1, c_2, \ldots, c_n\}$ represents a set of decision analysis criteria used to evaluate the alternatives and $\{a_1, a_2, \ldots, a_m\}$ is a set of feasible alternatives that will be scored on the criteria. p_{ij} represent the scores of the different alternatives on the criteria. The goal is to evaluate and rank the alternatives based on the criteria provided. A common way to evaluate an alternative is to assign weights. The overall value of alternative i, Vi can be obtained using a lot of methods. In a common form, if we assign weight w_j ($w_j \geq 0$; $\sum w_j = 1$) to criterion j, then Vi can be obtained using a simple additive weighted value function, which is the underlying model for most MCDM methods, as follows [36]:

$$V_i = \sum_{j=0}^{n} WjPij$$

3.2 Data Collection

To collect the most accurate probabilistic data, we first identified groups of highly specialized professional working in the logistics sector. All of them are knowledgeable enough to understand the problems, conveniences and difficulties of last-mile delivery in Vietnam. By means of an online survey via email and Facebook, we sent the questionnaire to 15 people and we only received 8 responses. However, 3 of them did not use the services of J&T express company, so we finally reviewed and analyzed the data based on the answers of

the remaining 5 people. The questionnaire was sent to logistics experts from May 13, 2022 to May 27, 2022.
Table 2 shows the demographic table of the 5 respondents.

Table 2. Overview of respondents

Respondent	Country	Area of Expertise	Affiliation	Experience (Years)	Education
1	Vietnam	Business Administration	Industry commercial	12	PhD
2	Vietnam	Port and Logistics Management	Academic	5	Master Degree
3	Vietnam	International Logistics	Industry Research	5	Master Degree
4	Vietnam	Port and Logistics Management	Industry commercial	8	PhD
5	Vietnam	International Logistics	Industry commercial	6	Master Degree

3.3 Data Analysis

In order to assess the overall efficiency of the research to meet the expectations of customers in choosing the most satisfactory last-mile delivery company in Vietnam, we empirically applied BWM to perform this scientific scrutinization with five extremely indispensable categories as our criteria. The first step of this part plays a pivotal role in determining the evaluation criteria for final decision making about which alternative mentioned as three last-mile delivery companies in Vietnam is the best to select.
As depicted in figure 1, the five analytical categories are: Delivery cost, Lead time, Customer service, Insurance Policy and Delivery reliability. It is also considered three alternatives including Giaohangtietkiem, Giaohangnhanh and J&T Express which are three popular shipping businesses that provide last-mile delivery service in Vietnam.

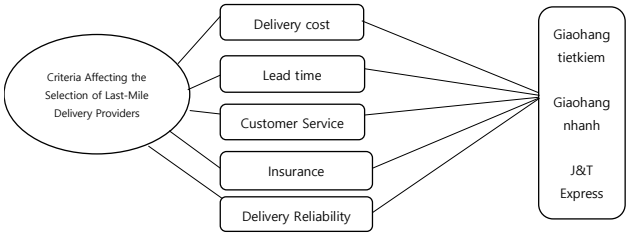

Figure 1. Summary of the Criteria and Alternatives

In this second step a survey was conducted to collect and assess the respondents' opinions and be able to investigate the following research questions "Which of the five criteria is the most essential for selecting a last-mile delivery company in Vietnam?" and "Which of the five criteria is the least important for selecting a last-mile delivery corporation in Vietnam?". This section refers to the most necessary criterion as the best and the least one as the worst.

The third step is finding the preference of the best criterion over all other criteria. Table 3 presents the best to other criteria vectors. To obtain this, respondents ranked the importance of the best criterion over all other criteria using a 1–9 scale. Hence, we can express the best to others vector as:

$$A_B = (a_{b1}, a_{b2}, \dots, a_{bn})$$

In the equation above, a_{bj} indicates the preference of the best criterion B over the criterion j.

Table 3. Best to other vectors

Respondent	Best	Cost	Lead time	Customer Service	Insurance Policy	Delivery reliability
1	Cost	1	3	4	3	3
2	Cost	1	3	6	4	3
3	Cost	1	3	6	3	4
4	Cost	1	2	5	3	4
5	Lead time	2	1	3	4	2

*1 indicates equal importance and 9 indicates absolutely more important (*)

Table 3 shows four of five respondents chose 'Cost' to be of most paramount importance. While only the fifth respondent chose 'Lead time' as the best one criterion. A summary of the respondents' view of the best criterion is shown in figure 2.

Figure 2. Respondents' Best Criterion

Based on the pie chart, the majority of respondents choose 'Cost' is the best criterion and the other choose 'Lead time' is the worst with the statistics being 80% and 20% respectively.
The fourth step is finding the preference of all other criteria over the worst criterion.
Table 4 presents the other to the worst vector. Respondents ranked the importance of all other criteria over the worst criterion on a scale from 1 to 9. Hence, we can express the others to worst vector as:

$$A_w = (a_{1w}, a_{w2}, \dots, a_{nw}) \quad (2)$$

Here, a_{jw} indicates the preference of the criterion j over the worst criterion W.

Table 4. Other to worst vectors

Respondent	Worst	Cost	Lead time	Customer Service	Insurance Policy	Delivery reliability
1	Customer Service	7	6	2	6	6
2	Customer Service	5	3	1	4	3
3	Customer Service	5	4	1	3	4
4	Customer Service	4	2	1	2	3
5	Cost	1	5	4	2	3

*1 indicates equal importance and 9 indicates absolutely more important. (*)

Corresponding to the stream of finding the worst criterion, it is clearly observed that most of the respondents chose 'Customer service' criterion as the worst one; whereas, the last respondent indicated 'Cost' as the worst. Figure 3 depicts the respondents' worst criterion selection.

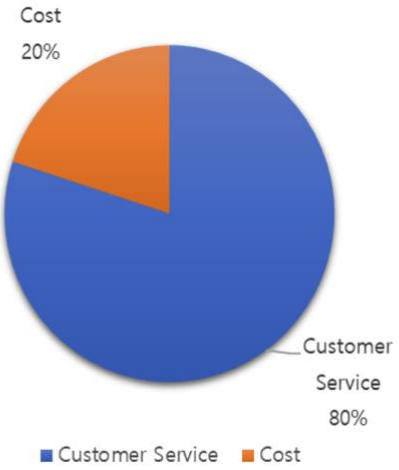

Figure 3. Respondents' Worst Criterion

Obviously, the percentage of respondents choosing the 'Customer service' is the worst criterion taking 80% of the total. On the other hand, there are only 20 percent of respondents electing 'Cost' criterion is the worst.

The fifth step, which is estimating optimal weights, focuses on minimizing the maximum absolute differences for all j to find the optimal weights of a criterion. Following [37], it can be expressed the minimization problem as: (3)

$$\min \left[\max_j \left(\left|w_b - a_{bj}\, w_j\right|,\ \left|w_j - a_{jw}\, w_w\right|\right)\right]$$

$$\text{s.t. } \sum_j w_j = 1 \qquad (3)$$

$$w_j \geq 0, for\ all\ j$$

We can solve (3) as a linear optimization model shown in (4):

$$\min \delta^L$$

s.t.

$$\left|w_b - a_{bj}\, w_j\right| \leq \delta^L, for\ all\ j$$
$$\left|w_j - a_{jw}\, w_w\right| \leq \delta^L, for\ all\ j \qquad (4)$$
$$\sum_j w_j = 1$$
$$w_j \geq 0, \quad for\ all\ j$$

A solution to (4) gives the optimal weights (w_1^*, w_2^*, …, w_n^*) as well as the optimal value of (*) is the consistency ratio of the pairwise comparison procedure in BWM. This solving process is performed by applying the BWM Excel solver. The optimal weights of each of the criteria and consistency ratio of each respondent is presented in Table 5. As the consistency ratio in BWM is output-based, a (*) up to 0.459 is acceptable for studies with five criteria [40]. In this study, the average consistency ratio is approximately 0.158, and none of the individual consistency values exceeded the maximum threshold.

Table 5. Optimal weights (Full sample)

Respondent	Cost	Lead time	Customer Service	Insurance Policy	Delivery Reliability	δ_L
1	**0.286**	0.190	0.143	0.190	0.190	0.2857
2	**0.433**	0.183	0.063	0.137	0.183	0.1162
3	**0.433**	0.183	0.063	0.183	0.137	0.1162
4	**0.393**	0.246	0.074	0.164	0.123	0.0983
5	0.087	**0.348**	0.174	0.130	0.261	0.1740
Mean	**0.326**	0.230	0.103	0.161	0.179	0.1581

Bold indicates the highest priority score

The optimal weights table provides statistics indicating that most of the highest rates mainly concentrate on 'Cost' criterion with four respondents' weights of 0.286, 0.433, 0.433 and 0.393 respectively.

The sixth step is calculating the final priority of alternatives for selecting a last-mile delivery company in Vietnam. It is necessary to have the competitiveness scores for each of the three company alternatives. Respondents were asked to rate the competitiveness level of the three alternatives under each of the five criteria using a 1–9 scale, where 1 refers to 'not important at all' and 9 refers to 'extremely important'. Table 6 presents the responses of the 1st respondent as an example. The values are then normalized in Table 6 by dividing each value by their respective column-wise maximum value.

$$\left(x_{ij}^{norm} = \frac{x_{ij}}{x_j^{max}}\right)$$

Table 6. Competitiveness of last-mile service provider under each criterion (Respondent 1 example)

Alternative/Criteria	Cost	Lead time	Customer Service	Insurance Policy	Delivery Reliability
Giaohangtietkiem	3	4	5	4	4
Giaohangnhanh	3	1	4	3	2
J&T express	3	3	5	2	2

Table 7 presents the normalized values. In order to calculate the priority of the three alternatives, we present as example the 1st respondent response. First, we multiply each of the normalized values in Table 7 by their respective weights. In the final stage, we take the row-wise total and get the final priority scores of each of the ship alternatives (Table 8). This process can be expressed as follows:

$$Z_i = \sum_{j=1}^{n} w_j \; x_{ij}^{norm} \qquad (5)$$

In the above equation, Zi is the final priority value of the alternative i and x_{ij}^{norm} represents the normalized values of the criterion j under the alternative i.

Table 7. Normalized values (Respondent 1 example)

Alternative/Criteria	Cost	Lead time	Customer Service	Insurance Policy	Delivery Reliability
Weights	0.2857	0.1905	0.1429	0.1905	0.1905
Giaohangtietkiem	1	1	1	1	1
Giaohangnhanh	1	0.25	0.8	0.75	0.5
J&T express	1	0.75	1	0.5	0.5

Table 8 depicts the priority of alternatives and, as example, respondent 1 priorities are shown. The highest weight is the 'Cost' criterion with a score of 0.286; whereas the 'Customer service' gain the lowest score with only 0.143. The others stand with comparative scores which are nearly 0.1905. Table 8 shows more clearly that the priority of choosing last-mile delivery company from respondent 1 is 'Giaohangtietkiem'. Obviously, the 'Giaohangtietkiem' company gains the highest rate from three alternatives with the statistic is 1; whereas, the 'Giaohangnhanh' and 'J&T express' only get comparative value which is approximately 0.686 and 0.762 respectively.

Table 8. Priority of alternatives (Respondent 1 example)

Alternative/ Criteria	Cost	Lead time	Customer Service	Insurance Policy	Delivery Reliability	Overall
Giaohangtietkiem	0.2857	0.1905	0.1429	0.1905	0.1905	1
Giaohangnhanh	0.2857	0.0476	0.1143	0.1429	0.0952	0.6857
J&T express	0.2857	0.1429	0.1429	0.0952	0.0952	0.7619

By repeating the same calculation process demonstrated in Tables 6–8, the priorities can be calculated for the last-mile delivery company categories for all respondents, which is presented in Table 9.

Table 9. Priorities for last-mile delivery provider selection (Full sample)

Respondent	Giaohangtietkiem	Giaohangnhanh	J&T express
1	**0.2**	0.1371	0.1524
2	**0.1759**	0.1504	0.1535
3	**0.1707**	0.1352	0.1386
4	**0.1746**	0.1439	0.1452
5	0.15	**0.1907**	0.1588
Mean	**0.8712**	0.7573	0.7485

Bold indicates the highest priority score

In Table 8, the priority score of each last-mile delivery company alternative under each of the criteria for respondent 1 was presented. To find the aggregate priorities, we calculate the average of all respondents. (Table 10).

Table 10. Priority of alternatives under each criterion (Full sample aggregate level)

Alternative/Criteria	Cost	Lead time	Customer Service	Insurance Policy	Delivery Reliability	Average
Giaohangtietkiem	**0.3265**	0.1673	0.101	0.1243	0.1521	**0.1742**
Giaohangnhanh	**0.2268**	0.1782	0.0872	0.1406	0.1244	0.1515
J&T express	**0.2116**	0.2032	0.0913	0.1274	0.115	0.1497

Bold indicates the highest priority score of alternatives

Overall, the Giaohangtietkiem company is the most preferred for last-mile shipping as indicated by the highest score in the average column, followed by Giaohangnhanh and J&T express gaining the second and the third respectively. This indicates that the Giaohangnhanh and J&T express company, showing an overall lower score, need to improve in last-mile delivery services to get closer in the competitive gap with Giaohangtietkiem.

4. Results

According to the results of the study, Giaohangtietkiem is the best choice for customers in using last-mile delivery services in Vietnam. Giaohangtietkiem operates with outstanding features such as providing good customer service (score of 0.101), a professional website system that meets standards and more importantly, its shipping fee is quite low compared to the market competitors and this was shown in the highest score yield of 0.326. So, this company appears to be attractive with customers and their requirements. Simultaneously, "Shipping cost" is the most pivotal criterion to be considered and "Customer service" is the least important when selecting a company providing last-mile shipping service. On the other hand, Giaohangnhanh and J&T express scored on average lower compared to Giaohangtietkiem and their score difference is minimal (0.1515 and 0.1497 respectively). Giaohangnhanh scored higher than J&T express for cost, insurance policy and delivery reliability, showing greater attention to operational last-mile services. J&T express showed higher scores for lead time and customer services. The results seem to be in line with current customers'' requirements such as delivery price when using last mile delivery services. There is lower interest from customers' perspective about on-time delivery, insurance policies or quality of service. But in fact, customers may want to receive preferential offers such as discount codes, vouchers or "free ship" programs in addition to a low delivery cost perception. These have completely become

key strategies for logistics service providers to approach and retain customers. However, besides the strong point of delivery cost, most of the remaining standards are still not equally appreciated such as service quality or on-time delivery. Therefore, some managerial recommendation can be proposed based on the results of the study. Firstly, service providers should invest in cutting delivery costs or actively open many preferential programs to attract customers, especially with bulk goods or goods transported long distances. In some cases, it can be advantageous to give customers a reason to keep buying services or products. To strengthen customer loyalty, companies offer special discounts to customers making regular purchases [41]. This strategy is called a 'loyalty program". Secondly, enterprises need to control the transportation process and ensure that the quality of goods delivered to customers is completed in order to increase the reliability of customers. During the Covid pandemic and in a post pandemic world, customer requirements have been quickly changing and the reliability of last mile delivery is important as "Customer satisfaction refers to the level of fulfillment expressed by the customer after the service delivery process" [42]. Besides, enterprises need to invest in technology and equipment, simplify procedures to speed up last-mile delivery service and create comfort for customers when placing orders on the system. Finally, enterprises need to pay attention to expand marketing, communication, and e-commerce system connection to create familiarity and a connection with different customers segments.

5. Conclusion

In general, last-mile delivery in logistics is considered as the last part in the delivery process and one the most important processes as last-mile delivery can directly affect service quality and end-customers' satisfaction from the first time they receive a product.

However, in fact, the last mile delivery services of Vietnamese businesses still have some limitations, making it difficult for customers to gain access to the services. Through theoretical and practical research, this article has examined 5 different criteria (lead-time, cost, customer service, insurance policy and delivery reliability) with an aim to provide an overview of last mile delivery activities in Vietnam under the perspective of final customers using the service. The results, under the best-worst model, have shown that customers evaluate shipping cost as the most important factor when electing last-mile delivery services providers. Therefore, a business has two different options when it comes to charging service fee from customers, including setting a competitive price and offering a discounted or free shipping voucher in order to boost up the number of orders.

Moreover, the paper also pointed out the advantages that need to be promoted and the disadvantages that need to be improved for last-mile delivery in Vietnam based on the analysis of remaining decisive factors. From there, offering some solutions to overcome the outstanding difficulties so as to approach a more complete last-mile delivery trading industry in the future.

Nonetheless, this paper also has some limitations. First, due to the lack of respondents, the rating scale result of given criteria may not be the most accurate and would moderately change if the numbers of respondents was higher. For example, assuming that the participants are mostly elder or wealthy people, delivery reliability or customer service would be preferred rather than shipping cost when selecting a last-mile delivery company. Second, the results may gain more value if there are some extra references about the operational strategies of each alternative to find out which elements can make that company provide the lowest cost as well as reliable services to the consumers.

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