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The Changes of Customer Satisfaction with Logistics Services of International E-Commerce Due to the COVID-19 Outbreak: A Case Study Between Thailand and the People's Republic of China

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Abstract

Customer satisfaction has gained special attention in many business sectors, especially international e-commerce sectors, which have continuously showed increasing volume. Besides the quality of the products, the logistics services also affect customer satisfaction, such as delivery time, costs, and correction. But since the COVID-19 outbreak, there are huge changes to customers' shopping behaviours. Online shopping came into the spotlight. The aim of this study was to examine the changes in customer satisfaction with logistics services of e-commerce before and during the COVID-19 outbreak. In this study, the questionnaire design is built on the dimensions and indicators of the modified fuzzy SERVQUAL evaluation system and confirmed. The case study of online shopping, mainly between Thailand and the People's Republic of China, is used. Questionnaires gathered both online and offline from 232 experienced users were employed to collect data. Data were analysed using the Statistical Packages for Social Science (SPSS) version 17. The results were compared to the related research to show how issues that affect customer satisfaction have changed. During the COVID-19 outbreak, the most significant predictor changed from responsiveness to reliability. It scientifically confirms that in an unstable situation, the customers' focus shifted from how quickly the e-commerce organisation can serve them to how reliable the organisation is to ensure that they will get the right products and services. Conversely, the gap in customers' perception and expectation in the reliability dimension is also wider than before the COVID-19 outbreak. This result also implies that while the customer expects more reliability, the organisations cannot meet their expectations.

Keywords: Fuzzy SERVQUAL, Online Shopping, Service Quality

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1. INTRODUCTION

In this era, online shopping has gained outstanding growth rates due to the strong consumer demand and the increasing variety of available goods. As the Internet grows, people are increasingly dependent on it in their daily lives. At the same time, with the increasing number of people using smartphones, people in various countries have been able to quickly and easily get access to many e-commerce sites, since e-commerce can offer a lot of conveniences (Yang and Patitad, 2013). In 2019, online purchasing accounted for 14.1% of total retail sales, with a tendency to grow (Melović et al., 2021; Ouellette, 2020; Tolstoy et al., 2021). The COVID-19 pandemic has forced countries around the world to either go into lockdowns or enforce strict social distancing rules. It has motivated many shoppers to buy things online as much as possible due to lockdown measures or limited capacities to maintain social distancing (Choudhury, 2020). This causes significant changes with a greater proportion of Internet users using online shops, both international and domestic changes, to buy essential products, such as food and beverages, cosmetics, and medicines. Meanwhile, global e-commerce sales jumped to $26.7 trillion in 2019, up 4% from 2018, according to the latest available estimates (UNCTAD, n.d.).

In the online environment, online business and e-commerce are not difficult to emulate by competitors due to the higher competition. For online shopping, there are many the same type of online stores which making it difficult for companies to create differentiation. There is also an increased number of online stores for consumers to choose from. It enables consumers to easily compare products, compare prices, gain information, share buying experiences with others, and to make a purchase within only a few minutes (Wang et al., 2019). At the same time, the emergence of the Internet has reduced the frictionless economy. Because of the low transaction costs, consumers can choose between competing suppliers (Brynjolfsson and Kahin, 2020; Yang and Patitad, 2013). Logistical issues become one of the key factors to respond to customers while keeping the firms efficient, because they include all activities for moving the products from the origin points to customers' hands. Especially in international e-commerce, cross-border transportation and inventory seem to be more complicated than domestic ones.

Customer satisfaction is regarded as the most important factor for a product or service. If companies fail to satisfy customers' requirements, the same business or transaction will be replaced by competitors who can provide better service to the customer. As a result, the company will lose its customers and potential profit (Khurshid et al., 2012). Customer satisfaction can represent how customers' expectation of provided services and products met. In the same way, it can be represented by a gap between customer expectation and perception. For international e-commerce, of which there are many types and levels of products, it is problematic to identify the level of the customers, which leads to difficulties to evaluate service quality. Also, during the COVID-19 outbreak, which has changed the behaviour of the international e-commerce market, it needs to be considered how customers change their satisfaction aspects. Thus, firms can adapt themselves to compete in a highly aggressive environment.

This research aims to determine and measure the logistics service quality of international e-commerce by determining customers' expectations and perceptions using the fuzzy SERVQUAL model. The top-five company that manages the international e-commerce between Thailand and the People's Republic of China is employed as the case study. To determine the changes of customer satisfaction with the logistics service quality of international e-commerce during the COVID-19 outbreak, the results are compared and analysed with previous research focused on the same area (Huan et al., 2019; Yang and Patitad, 2013).

2. LITERATURE REVIEW

2.1 Customer satisfaction with logistics services

Customer satisfaction has been a major goal for business organisations for many years because loyal customers contribute to the company's profitability by spending more on the company's products and services (Chaowarat et al., 2015; Dimitriades, 2006). For the logistics service, customer satisfaction can be considered as one of the key performances that represent the results of how the providers can fulfil customers' requirements and expectations (Cichosz et al., 2017; S´witała et al., 2019). It can involve only a single activity or as cumulative satisfaction (Stank et al. ,2003; S´witałaetal.,2019; Zhang et al., 2015). On the other hand, customer satisfaction could be considered as customer requirements that meet expectations (Chaowarat et al., 2015). Therefore, customer satisfaction criterion not only presents the degree of customer satisfaction but also reflects how logistics service providers can serve their customers. The criterion reflects not only the degree of customer satisfaction but also how companies provide their service in relation to customer demand.

Regarding the evaluation of the quality of logistics services, the most traditional evaluation is the 7 R theory (Mentzer et al., 1989). This model measures how the company can deliver goods to the designated location at the most appropriate time, with accurate cargo status, appropriate cost, and accurate and relevant information. The theory also holds that logistics services can enhance product value. This is mainly focused on the service provider side. In other words, the evaluation of service quality is attributed to the service provider firm. Mentzer et al., (2001) considered the customer's perceptions in logistics services. In this research, the logistics service was considered with two aspects: physical distribution service and customer marketing service. This is similar to Gronroos's (1984) technical quality and functional quality concept. The model proposed that customers' perceptions affect the logistics service quality.

The relationship between the quality of logistics service and customer satisfaction has gained much attention in the research field (Kilibarda and Andrejic´, 2012; Uvet, 2020; Winter Fernandes, 2018). In logistics services, customer satisfaction is generated when the provider's performance is equal to or greater than the customer's preconceived expectations. In 1985, Parasuraman et al. (1988) introduced the five-dimensional structure of service quality (SERVQUAL) — tangibles, responsiveness, empathy, reliability, and assurance — to identify gaps between customer perceptions and customer service. SERVQUAL allows firms to assess their service quality performance on the basis of each dimension individually as well as the overall dimensions. This method has been applied to measure the gap between customers' perception and their expectation of logistics services, such as in third-party logistics service providers in the beverage industry (Mathong et al., 2020), logistics service quality in Da Nang city (Limbourg et al., 2016), service quality in Indonesia (Er et al., 2015), and customer loyalty (Ismail and Yunan, 2016).

3. RESEARCH METHODOLOGY

This section describes the methodology of this research, which is shown in Figure 1. The research was separated into four main steps: 1) framework development and data collection, 2) data processing, 3) data analysis, and 4) conclusion and discussion.

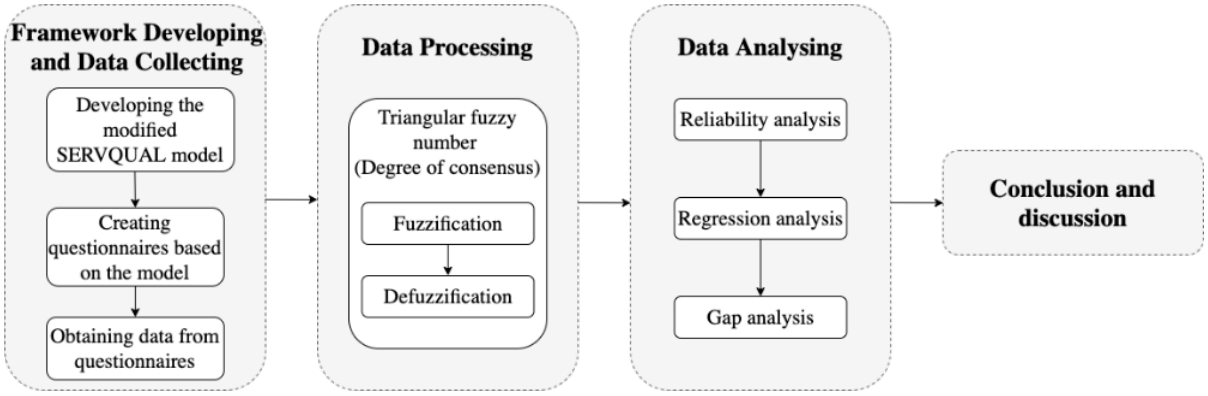

Figure 1 Research process

3.1 Framework development and data collection

The framework proposed in this sub-section introduces the modified SERVQUAL model that is used in this research (Figure 2). Firstly, the modified SERVQUAL model is the same as the model introduced by Huan et al. (2019). In the model, there are six dimensions concerning logistics service quality for international e-commerce. The first five dimensions are from the original SERVQUAL model. Carman (1990) pointed out that the different backgrounds of each industry should be considered when evaluating the service quality of industries. They should be different, and the importance of each dimension may differ regarding the industry. In the e-commerce environment, information is critical because it is one of the key factors that customers consider when they make decisions. Thus, information quality is added to the model. Then the questionnaire based on the SERVQUAL model was used to collect data. Each dimension is explained below.

- Reliability: the ability to provide accurate logistics services
- Tangible: the facilities and equipment of logistics service providers
- Assurance: the ability to convey confidence and trust to the customer
- Empathy: the ability to understand the position of customers to solve problems for customers and provide personalized services
- Responsiveness: the ability to respond quickly to the customer's demand
- Information quality: the ability to convey accurate and up-to-date information to customers

The questionnaires to collect data were designed based on the modified SERVQUAL model. There were 22 questions in the survey, and the questions consisted of six modified SERVQUAL dimensions, which are shown in Table 1. In the questionnaires, a Likert scale was used to rate expectation and perception. The scale is typically stated in five points: (1) strongly disagree; (2) disagree; (3) neither agree nor disagree; (4) agree; (5) strongly agree (Preedy and Watson, 2010). To obtain the data, both offline and online questionnaires were used. The questionnaire was sent to 240 people who have experience using the e-commerce company that facilitates transactions between Thailand and the People's Republic of China.

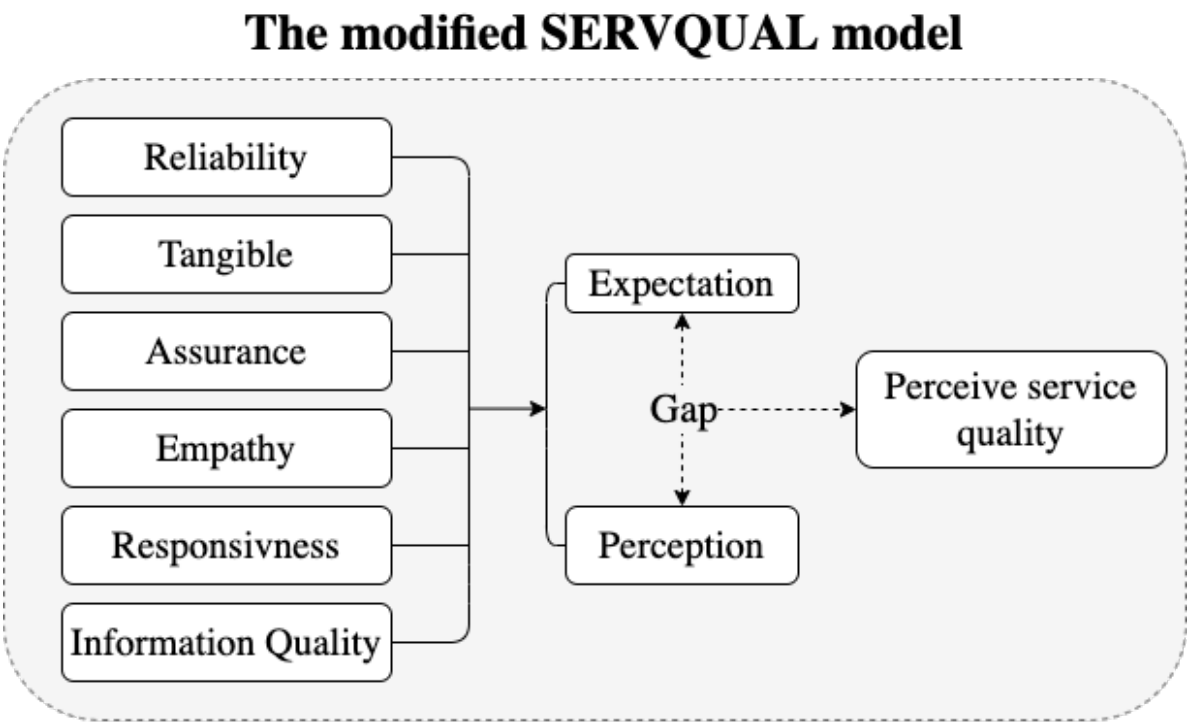

Figure 2 Research framework

4. DATA PROCESSING

In this stage, data were processed using the fuzzy set theory due to uncertainty, bias, and ambiguity from representing an assessment of service quality with a fixed scale and value. This theory is an approach to deal with problems relating to ambiguous, subjective, and imprecise judgments, and it can accommodate the linguistic facet with the numerical languages of available data and preferences for individual or group decision-making (Bon-Gang, 2018).

Once the data were collected, a recapitulation of expectation and perception rate was conducted. In the fuzzification process, the crisp values were translated or mapped to a fuzzy language/set. In this process, the lower boundary value, middle boundary value, and upper boundary value were obtained, as shown in Table 2. In this study, triangular fuzzy numbers, which are generally used to represent uncertain and incomplete information in decision-making, risk evaluation, and expert systems (Xixiang Zhang, 2014), are used.

Table 1 Criteria of each dimension in the model

Dimension	Criteria
Reliability	Q1. The item you received is correct (quantity, colour, package, etc.)
	Q2. Relevant order confirmation is sent to you
	Q3. Deliverable region coverage
	Q4. The service is qualified
Tangibles	Q5. The webpage is well organised and standardised
	Q6. Reasonable delivery fee charges
	Q7. Supports various payment methods on the website
	Q8. You experienced polite communication
Responsiveness	Q9. Delivery time (from order to reception)
	Q10. Readiness to answer your inquiry
	Q11. Being able to handle your returns and exchange goods promptly
Empathy	Q12. Emergency handling capacity of AliExpress online employees (like product lost or damaged)
	Q13. The website has your preference at heart
	Q14. Employees of AliExpress are proficient in logistics operations
Assurance	Q15. The website contains service details (price list of delivery, payment method, etc.)
	Q16. Being able to keep your shopping information confidential
	Q17. You feel safe and comfortable during transaction on the website
	Q18. Employees of AliExpress are consistently courteous
Information quality	Q19. Information is current and timely
	Q20. You got the necessary information
	Q21. The provided logistics information is accurate and reliable
	Q22. Information is easy to understand

Table 2 Linguistic variable and triangular membership function

Scale	Membership function	Linguistic variable
1	(1,1,2)	Strongly disagree
2	(1,2,3)	Disagree
3	(2,3,4)	Neither agree nor disagree
4	(3,4,5)	Agree
5	(4,5,5)	Strongly agree

Once the fuzzy set was gained, defuzzification was conducted to transform output from the fuzzy set to the crisp value. The defuzzification process was implemented using the following equation.

$$M_i = (lw_i + mw_i + uw_i)^{\frac{1}{3}}$$

where
M_i : The relative non-fuzzy weight of the $i-th$ criteria

lw_i :The lower value of the $i-th$ criteria

mw_i :The medium value of the $i-th$ criteria

uw_i :The upper value of the $i-th$ criteria.

5. DATA ANALYSIS

In this stage, the data from the previous stages were analysed for reliability, regression, and gap between the expectation and perception. To show the internal consistency of the model, Cronbach's alpha value was used. If the value is lower than 0.5, it means low reliability. If there is less correlation between indicators, the result is unacceptable. The value between 0.5 and 0.7 shows moderate reliability. The value between 0.7 and 0.9 reveals high reliability. A Cronbach's alpha value larger than 0.9 shows excellent reliability (Barbera and Pentecost, 2020; Bathgate, et al., 2015; Shemwell et al., 2015; Taber, 2018). To identify the weight of each dimension and each criterion in the model, regression analysis was used by extracting relevant information based on the actual data value. In continuation, the service quality gap between customers' expectations and perceptions was determined.

6. RESULTS AND DISCUSSION

The reliability statistics of the model are shown in Table 3. The first column shows the six dimensions of the modified SERVQUAL model from the previous section. In the second column, the number of indicators or items of each dimension is shown. The criteria for each dimension are shown in the third column of Table 3. And in the last column, the corresponding Cronbach's alpha value of six dimensions is shown. The Cronbach's alpha values of all dimensions are between 0.698 and 0.766. This shows that the internal consistency of these dimensions is acceptable.

Table 3 Reliability statistics

Dimension	No. of criteria	Cronbach's alpha
Reliability	4	0.766
Tangibles	4	0.698
Responsiveness	4	0.756
Empathy	4	0.698
Assurance	4	0.737
Information quality	4	0.717

A coefficient matrix is shown in Table 4. Coefficients are normalised to get weight. In this study, customer satisfaction is used as the dependent variable. The first column shows all six dimensions used in this research.

The second and third columns show B values, which show how much the dependent variables can be predicted by the independent variables and their standard errors. In the fourth column, the T values are shown, which are the ratio between the B value and its standard error. In the last column, the p−value is shown to indicate the significance level. In this study, with a 95% confidence interval, the p−value of all predictors is less than 0.05, which indicates a statistically significant difference between customer satisfaction and all dimensions in the model.

Table 4 Coefficient matrix of the overall model

Dimension	B	Std. error	T	Sig
Reliability	0.2	0.041	4.356	0.002*
Tangibles	0.085	0.034	2.094	-
Responsiveness	0.108	0.01	3.165	-
Empathy	0.093	0.045	2.315	-
Assurance	0.103	0.042	2.948	0.001*
Information quality	0.02	0.036	2.087	-

**p<0.01*

To calculate the weight equation in fuzzy logic, use the equation presented by Krejčí and Stoklasa (2018). These weights show, in each dimension, the most related criteria that affect the dimension.

$$W_{ij} = \frac{c_{ij}}{\sum_{j=1}^{n_i} c_{ij}}$$

where

W_{ij} : Weight of the $j-th$ criteria of the $i-th$ dimension

c_{ij} : Coefficient value of the $j-th$ criteria of the $i-th$ dimension

n_i : Number of criteria in the $i - t\ h$ dimension.

The coefficient value of each dimension is shown in the second column of Table 5. We can see that the dimension that gained the highest weight is the reliability dimension (0.328), followed by the responsiveness dimension (0.177), the assurance dimension (0.169), the empathy dimension (0.153), the tangibles dimension (0.140), and the information quality dimension (0.033).

In the reliability dimension, which represents how reliable and accurate international e-commerce is, the criterion that gained the highest score is ‘Q1: The item you receive is correct’ with a score of 0.341, followed by ‘Q4: The service quality is qualified’ with a score of 0.306. From this result, we can see that the accuracy and quality of service have significance from customers.

For the tangibles dimension, which shows how customers can access the provided service, the criterion with the highest weight is 'Q6: Reasonable delivery fee charges' with a score of 0.402. The second is 'Q8: You experienced polite communication' with a score of 0.312. This implies that customers may seek the proper service in terms of both price and level of communication.

To show how reactive international e-commerce is, the responsiveness dimension is applied. The result shows that the customers focus on how quickly they can receive their products ('Q9: Delivery time' with a score of 0.567) and how the service providers react to their problems ('Q11: Being able to handle your returns and exchange goods promptly' with a score of 0.567).

Table 5 Coefficient matrix of the proposed model

Dimension	**Weight (*Wi*)**	**Criteria**	**Relative weight (*Wij*)**	**Absolute weight**	**Rank**
Reliability	0.328	Q1.	0.341	0.112	2
		Q2.	0.111	0.037	13
		Q3.	0.242	0.079	6
		Q4.	0.306	0.100	5
Tangibles	0.140	Q5.	0.048	0.007	21
		Q6.	0.402	0.056	10
		Q7.	0.238	0.033	14
		Q8.	0.312	0.044	12
Responsiveness	0.177	Q9.	0.567	0.100	4
		Q10.	0.121	0.021	16
		Q11.	0.312	0.055	11
Empathy	0.153	Q12.	0.422	0.065	8
		Q13.	0.393	0.060	9
		Q14.	0.185	0.028	15
Assurance	0.169	Q15.	0.035	0.011	18
		Q16.	0.363	0.109	3
		Q17.	0.379	0.114	1
		Q18.	0.223	0.067	7
Information quality	0.033	Q19.	0.293	0.010	19
		Q20.	0.253	0.008	20
		Q21.	0.378	0.012	17
		Q22.	0.076	0.002	22

Focusing the ability of international e-commerce service providers to try to solve problems for customers and provide personalised services (the empathy dimension), the prompt standbys of emergency cases (Q12) and customer preference identification (Q13) earn high weight with a score of 0.422 and 0.393, respectively.

Table 6 SEVQUAL score of the proposed model

Dimension	**Weight**	**SEVQUAL score**	**Criteria**	**During COVID-19**			
				Perception score	**Expectation score**	**Gap**	**Rank**
Reliability	0.328	-1.750	Q1.	3.042	4.328	-1.286	8
			Q2.	3.363	3.654	-0.291	21
			Q3.	2.543	4.648	-2.105	3
			Q4.	2.562	4.696	-2.134	2
Tangibles	0.140	-0.480	Q5.	3.452	3.494	-0.042	22
			Q6.	2.632	4.213	-1.581	5
			Q7.	2.958	3.875	-0.917	14
			Q8.	3.012	3.899	-0.887	15
Responsiveness	0.177	-0.846	Q9.	2.352	4.854	-2.502	1
			Q10.	2.893	3.931	-1.038	12
			Q11.	2.672	4.010	-1.338	6
Empathy	0.153	-0.391	Q12.	2.799	4.444	-1.645	4
			Q13.	3.112	3.720	-0.608	19
			Q14.	3.367	3.767	-0.400	20
Assurance	0.169	-0.692	Q15.	3.253	4.029	-0.776	17
			Q16.	3.238	4.450	-1.212	10
			Q17.	3.564	4.712	-1.148	11
			Q18.	3.418	4.377	-0.959	13
Information quality	0.033	-0.134	Q19.	2.899	4.116	-1.217	9
			Q20.	3.337	4.128	-0.791	16
			Q21.	3.127	4.543	-1.416	7
			Q22.	3.322	3.967	-0.645	18

In the assurance dimension, which represents how secure the system is, the scores of each criterion are not that different. This result implies that if the safety system is mentioned, all the topics that are related gained almost the same importance.

In international e-commerce, different languages may affect the information that customers expect. Thus, the information quality dimension is included in the proposed model. To focus on what the customer prioritises, the result indicated that accurate, reliable, and up-to-date information is the most necessary for them (Q19 and Q21).

To compare the weight of each criterion across different dimensions, the absolute weight of each criterion is calculated by multiply the relative weight with its dimension weight. The absolute weight of all criteria and their rank are shown in the fifth and last columns of Table 5. Of the top five criteria that receive high weight when the overall model is compared, the most important criteria show the secure and comfortable use of the service (Q17), followed by the accuracy of products (Q1), customer privacy (Q16), time that takes from product ordering to reception (Q9), and acceptable product quality (Q4).

After the importance of each dimension and criteria is known, the gap between customer expectation and perception is analysed. The result is shown in Table 6. The first and second columns show each dimension and its important weight. The third column presents the total SEVQUAL score, which is the multiplication of the total gap of each criterion in each dimension and its weight. In the fourth, fifth, and sixth columns, each criterion and its perception score and expectation score are shown. The last column presents the gap between perception scores and expectation scores. The result shows that the most unsatisfactory dimension is the reliability dimension, which gains the highest weight. The most unsatisfied indicator is the delivery time in the responsiveness dimension. This means customers focus on reliable products and services, while the company also fails to provide them. The same way with the responsiveness dimension, it also earns the second rank of unsatisfactory dimension, especially on the time of delivery.

6.1 Data Comparison between before and during the COVID-19 outbreak

To determine the change of customer satisfaction with logistics services of international e-commerce, the result from Huan et al. (2019) is used to represent customer satisfaction before the COVID-19 outbreak. In the comparison, the weight of each dimension and the top five criteria are compared with the gap between customer perception and expectation. The comparison of the importance weights of each dimension is shown in Table 7. Before the COVID-19 outbreak, the most important dimension was responsiveness, which represents how prompt the firm is to provide services to customers, followed by the reliability dimension. During the COVID-19 outbreak, the importance weights of the two dimensions switched. The reliability dimension gained the highest weight, while the responsiveness dimension is in the second rank. The result shows that during the outbreak, customers shifted their consideration from how quickly they get a response to how confident they are in the services. This result is scientifically confirmed that during an unstable situation, the most critical issue for customer satisfaction is the reliability of products and services.

Table 7 The importance weights of the six dimensions before and during the COVID-19 outbreak

Dimension	Weight	
	Before COVID-19 outbreak (Huan et al., 2019)	**During COVID-19 outbreak**
Reliability	**0.199**	**0.328**
Tangibles	0.157	0.14
Responsiveness	**0.332**	**0.177**
Empathy	0.172	0.153
Assurance	0.103	0.169
Information quality	0.037	0.033

To examine how the criteria affect change in customer satisfaction, a comparison between the top five criteria before and during the outbreak is reviewed. The comparison is shown in Table 8. Before the outbreak, the customers focused on how quickly they will get their packages and how quickly they get their confirmation. During the outbreak, they focused on how secure they feel and whether the products they ordered are correct. The result exhibits a shift of customer focus from quality, timely, and prompt services to risk-free, secure, timely, and accurate services.

Table 8 The top five criteria that receive the highest weight before and during the COVID-19 outbreak

Criteria	Before COVID-19 outbreak (Huan et al., 2019)	During COVID-19 outbreak
1	Q9. Delivery time (from order to reception)	Q17. You feel safe and comfortable during transaction on the website
2	Q10. Readiness to answer your inquiry	Q1. The item you received is correct (quantity, colour, package, etc.)
3	Q1. The item you received is correct (quantity, colour, package, etc.)	Q16. Being able to keep your shopping information confidential
4	Q4. The service quality is qualified	Q9. Delivery time (from order to reception)
5	Q14. Employees of AliExpress are proficient in logistics operations	Q4. The service quality is qualified

To determine the gap between customer perception and expectation, firstly, the SEVQUAL scores of each dimension were compared, as shown in Table 9. To identify the weight of each criterion in each dimension, the following equation was used. The weight of each criterion is shown in the fourth column of Table 3. Before the outbreak, the most unsatisfactory dimension was the responsiveness dimension, followed by the reliability dimension. Meanwhile, during the outbreak, the most unsatisfactory dimensions shifted to the reliability dimension and the responsiveness dimension. These results show the same trend with the importance weight of the dimensions. While the customer expects more for the reliability of services, the firm still fails to respond. The top five criteria with the biggest gap are shown in Table 10.

Table 9 The gap between customer perception and expectation before and during the COVID-19 outbreak

Dimension	Total SERVQUAL score	
	Before COVID-19 outbreak (Huan et al., 2019)	**During COVID-19 outbreak**
Reliability	**-1.322**	**-1.745**
Tangibles	-0.989	-0.475
Responsiveness	**-1.511**	**-0.853**
Empathy	-0.862	-0.389
Assurance	-0.889	-0.684
Information quality	-1.078	-0.135

Table 10 The top five criteria with the biggest gap before and during the COVID-19 outbreak

Rank	Before COVID-19 outbreak (Huan et al., 2019)				During COVID-19 outbreak			
	Criteria	**Perception score**	**Expectation score**	**Gap**	**Criteria**	**Perception score**	**Expectation score**	**Gap**
1	Q9. Delivery time (from order to reception)	2.400	4.520	-2.120	Q9. Delivery time (from order to reception)	2.352	4.854	-2.502
2	Q4. The service quality is qualified	2.640	4.590	-1.950	Q4. The service quality is qualified	2.562	4.696	-2.134
3	Q6. Reasonable delivery fee charges	2.730	4.350	-1.620	Q3. Deliverable region coverage	2.543	4.648	-2.105
4	Q3. Deliverable region coverage	2.870	4.260	-1.390	Q12. Emergency handling capacity of AliExpress online employees (like product lost or damaged)	2.799	4.444	-1.645
5	Q19. Information is current and timely	2.910	4.240	-1.330	Q6. Reasonable delivery fee charges	2.632	4.213	-1.581

The top two criteria with the biggest gap both before and during the outbreak are the same: 'Q9: Delivery time' and 'Q4: The service quality is qualified'. Both criteria represent time and quality for the logistics service. But the different criteria from both situations are the criteria rank of three, four, and five. Before the outbreak, the reasonable delivery fee of charges, deliverable region coverage, and information is current and timely received the third, fourth, and fifth rank with the biggest gaps, respectively. During the outbreak, they are deliverable region coverage, emergency handling capacity of AliExpress online employees, and reasonable delivery fee charges. The result is relatively the same

for customers' consideration of the logistics services. In considering the gap between customer expectation and the perception of the logistics service provider, the result shows that during the outbreak, the expectation of the customers is higher, whereas the perception of providers is lower.

7. CONCLUSION

The study confirmed a strong relationship between logistics service quality and customer satisfaction in international e-commerce. The case study is the online shopping company that handles transactions mainly between Thailand and the People's Republic of China. In this study, key performance criteria, which decide the satisfaction level of customers who use the logistics service of international e-commerce, are identified. The result implies that the most important dimension is the reliability dimension, which demonstrates how customers can devote themselves to the services. In considering the gap between customer perception and expectation, the most unsatisfactory dimension is also the reliability dimension. To observe changes of customer satisfaction perspective that may have occurred during the COVID-19 outbreak, results were compared with previous research (Huan et al., 2019; Yang and Patitad, 2013). Before the outbreak, the main dimension affecting customer satisfaction was the responsiveness dimension, which reflects how quickly and promptly the service providers serve the customers. During the outbreak, the main focus of customers satisfaction changed to the reliability dimension. This suggests that during the pandemic, fast and immediate service may no longer be the key performance indicator. Definite and secure services become an essential issue for increasing customer satisfaction. It is clear that in the unstable situation, customers shifted their satisfaction from responsiveness to reliability, and their expectation is also higher. But considering the logistics service providers' side, they still cannot provide services in a way that meets customers' expectation.

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