

Empirical Study on the Influencing Factors of Satisfaction of Logistics Service Quality of Cross-Border Import E-Commerce Based on KANO Model

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Abstract. The development of cross-border e-commerce cannot be separated from the coordination of cross-border logistics. Structural equation model is used to explore the influencing factors of logistics service satisfaction of cross-border import e-commerce. The results show that the service quality of cross-border logistics and its three dimensions namely basic service quality, value-added service quality and supply chain service quality have significant positive influence on customer satisfaction, and the supply chain service quality has the greatest influence on satisfaction, followed by basic service quality and value-added service quality; the logistics service quality and satisfaction of different cross-border e-commerce companies and different import logistics modes differ. The research has certain guidance and reference significance for cross-border import e-commerce to improve the satisfaction of logistics service.

Keywords. Cross-border e-commerce; Logistics service quality; Customer satisfaction; Structural equation model; KANO Model

1. Introduction

After the outbreak of COVID-19, consumers have shifted to online consumption on a large scale, stimulating the rapid development of the global e-commerce retail industry [1-5]. China's cross-border e-commerce has become a new growth point of foreign trade. Cross-border logistics plays an important role in connecting domestic and foreign trade, but the development of cross-border logistics lags behind, which limits the further development of cross-border e-commerce; the evaluation index system of cross-border logistics service plays an important role in standardizing the operation of cross-border logistics and improving the business level of cross-border logistics enterprises [6].

SERVQUAL model evaluates the service quality from five dimensions: tangible, assurance, empathy, reliability and responsiveness [7]. The LSQ model evaluates the logistics service quality from nine dimensions: personnel communication quality, order release quantity, information quality, ordering process, goods accuracy, goods integrity, goods quality, error processing and timeliness [8]. Some scholars have studied the

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influencing factors of cross-border logistics service satisfaction based on SERVQUAL and LSQ models. For example, the cross-border e-commerce logistics service quality was divided into economy, responsiveness, flexibility, reliability and empathy five dimensions, their influence on customer satisfaction was explored through the structure equation model, and the results showed that empathy was the biggest influence on satisfaction, followed by flexibility and economy, finally the reliability and responsiveness [9]. Using a similar scale, Liu Xingwang et al. found that the impact of economy on satisfaction was not significant, and the significant influence of the other four dimensions changed from large to small for personnel service quality, flexibility, reliability and timeliness [10]. Song Shuaiyu established the import bonded mode logistics service evaluation index system through project analysis and factor analysis and other statistical methods, with the availability, responsiveness, empathy, economy and security five dimensions, and found their importance in the customer from large to small was availability, responsiveness, empathy, security and economic [11]. As can be seen from the above literature, there are many factors affecting the satisfaction of cross-border logistics service. It is not easy to classify them based on SERVQUAL or LSQ models. Different scholars summarize different dimensions and indicators, and the importance of dimensions and indicators obtained through empirical studies is also different.

In the KANO model, the factors that affect satisfaction can be divided into five types, including basic demand, expected demand, excited demand, indifference demand and reverse demand [12]. Wang Yan and Kou Changhua discussed the needs of consumers for different levels of terminal cold chain distribution based on KANO model, and suggested the construction of a composite terminal cold chain mode to meet the basic demand, a whole supply chain cold chain mode to meet the desired demand and an innovative terminal cold chain mode to meet the exciting demand [13]. Based on Maslow's hierarchy of needs theory and the definition of international standards for service quality, Chen Yangyang divided the cross-border logistics service quality into basic service quality and value-added service quality [14]. Through online comment clustering analysis, Wei Rui found that in the cross-border e-commerce environment, customers attached great importance to the supply chain service capability of e-commerce to supply global new products [15]. Based on the reality of cross-border e-commerce logistics and KANO model, this paper evaluates cross-border logistics service from three dimensions: basic service quality, value-added service quality and supply chain service quality. Basic service includes the accuracy and integrity of goods in the LSQ model, value-added service includes error processing and timing in the LSQ model, and supply chain service include the modes of imported goods, supply channels and etc.

In addition, there are many qualitative studies on cross-border logistics models. Lin Qiaoli analyzed the development status and main problems of China's cross-border e-commerce overseas warehouse [16]. Zhang Xiaoheng and Li Doudou summarized the types and existing problems of overseas warehouses and put forward suggestions such as the preferential use of public overseas warehouse mode, and the construction of intelligent operation system of overseas warehouses, and making full use of the resources of the destination country [17]. Zeng Rong analyzed the problems and difficulties existing in the current bonded logistics mode and put forward a strategy to improve the problems of the bonded logistics mode in cross-border e-commerce [18]. Shen Tong analyzed several logistics modes of cross-border retail e-commerce in China, analyzed the existing problems of cross-border import e-commerce logistics and gave corresponding suggestions [19]. The above literature does not take into account customers' understanding or acceptance of these cross-border logistics modes. Therefore,

this paper also quantitatively studies the influence of different import logistics modes on customer satisfaction.

2. Research Hypothesis and Model Construction

In the cross-border e-commerce environment, customers place orders to buy imported goods on the e-commerce company, and the e-commerce company delivers the goods to customers through cross-border logistics. Compared with traditional e-commerce logistics, cross-border e-commerce logistics involves international transportation, customs declaration and inspection, domestic transportation, bonded warehousing, and other affairs, so it faces various uncertainties and risks. The quality of cross-border e-commerce logistics service has a significant impact on consumers' shopping experience and satisfaction [9, 20]. Therefore, propose the hypothesis:

H1: The quality of cross-border e-commerce logistics service has a significant positive impact on customer satisfaction.

Cross-border logistics will lead to weather, force majeure and human factors. The delivery of cross-border logistics service to the designated place is the most basic requirement for cross-border logistics service. Through empirical research, scholars found that the reliability, availability or security in cross-border logistics service had a significant impact on customer satisfaction [9-11, 15]. Therefore, propose the hypothesis:

H2: Basic service quality has a significant positive impact on customer satisfaction.

Due to the many links and long distance of cross-border logistics, customers need to wait for a long time to receive the goods after placing an order, and the return of money is also very complicated. Customers want cross-border e-commerce to promise when the goods will deliver and arrive, and can track the logistics information of the goods at any time; if quality problems occur, customers want e-commerce to process returns quickly. When Hsiao et al. studied cross-border logistics service, they found that 'logistics abnormal warning', 'delivery commitment' and 'APP service' as value-added service items would affect customers' willingness to use them [21]. Expected arrival time and allowing returns shall affect consumers' shopping motivation [22]. Based on this value-added service, customers will compare the logistics service quality of different cross-border e-commerce companies, so as to affect customer satisfaction and loyalty to e-commerce companies. Therefore, propose the hypothesis:

H3: The quality of value-added service has a significant positive impact on customer satisfaction.

Due to differences in policy, culture, economic development level and product production standards in different countries, coupled with logistics cost and space distance, some commodities cannot meet customer demand in time or even through cross-border transactions. The product supply capacity of cross-border e-commerce to consumer demand significantly affected the logistics service satisfaction [15]. Although customers buy imported goods through cross-border e-commerce companies, they often do not know what good goods are available overseas. If cross-border e-commerce can provide customers with a wide range of products from all over the world and launch new products soon, then customers will be very surprised and their satisfaction will increase. Therefore, propose the hypothesis:

H4: Supply chain service quality has a significant positive impact on customer satisfaction.

Based on the above assumptions, a theoretical model of cross-border e-commerce

logistics service satisfaction is constructed, as shown in Figure 1.

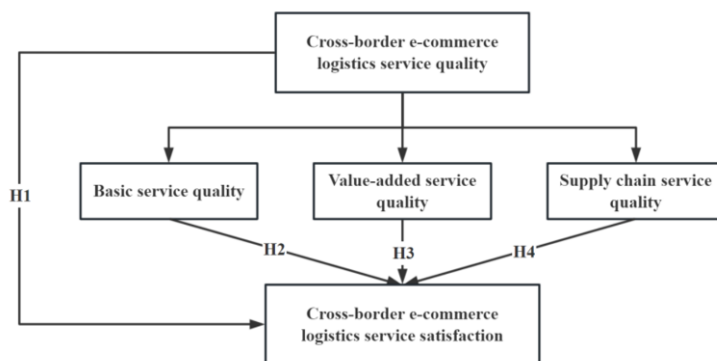


Figure 1. Theoretical model of satisfaction of cross-border e-commerce logistics service

3. Questionnaire Design and Survey

3.1. Questionnaire Design

This paper uses a structural equation model to study the relationship between basic service, value-added service, supply chain service, and customer satisfaction. After a small-scale pre-investigation and listening to expert suggestions, a formal questionnaire is formed. The main body of the questionnaire is made of the four dimensions of the theoretical model and 5-level Likert scales of 13 question items (1 dissatisfied, 2 unsatisfactory, 3 general, 4 satisfied, and 5 very satisfied), as shown in Table 1.

3.2. Questionnaire Survey

The formal survey was distributed and collected through the Questionnaire Star Mini-program. A total of 233 questionnaires were collected. After excluding invalid questionnaires such as no cross-border online shopping experience and misfilling, the remaining 204 valid questionnaires were found, with an effective recovery rate of 87.6%. The sample background information questions of the questionnaire included gender, age, occupation and annual family income, as well as the preferred cross-border e-commerce companies and import logistics model. Descriptive statistical analysis of the above sample background information is shown in Table 2; each item is reasonable and representative.

4. Empirical Results

4.1. Reliability and Validity Test

The Cronbach α coefficients are all greater than 0.9, indicating the high reliability quality of the data. In addition, the 'alpha coefficient of the deleted item' indicates that the reliability coefficient will not increase significantly after any item is deleted, so it indicates that the item should not be deleted. Validity is verified using KMO and Bartlett tests, and the

KMO value is 0.945 and p value is 0.000, indicating that the data are suitable for extracting factor information with good validity.

Table 1. Design of the questionnaire variables

Dimension	Question item	Scale source
Basic service	The goods themselves are intact and tidy	The LSQ model; the KANO model; Quan Chunni and Fan Yueqiao (2018); Dai Ying, etc. (2021)
	Goods are consistent with the order	
	Delivery is accurate	
	Delivery does not lose parts	
Value added service	Delivery and arrival on time	The LSQ model; the KANO model; Hsiao(2016); Zhang(2018)
	Logistics information update timely	
	The return is fast	
Supply chain service	There are many merchandises to choose from	KANO model; Wei Rui (2021)
	The new product is available quickly	
	Strong global supply capacity	
Customers satisfaction	Overall evaluation of logistics service	Dai Ying, etc. (2021); Chen Yangyang (2021)
	Evaluation compared with other cross-border e-commerce logistics	
	Buy again	

4.2. Confirmatory Factor Analysis

The confirmatory factor analysis (CFA) analysis is performed for the above 4 factors and 13 analysis items. The effective sample size is 204, 10 times beyond the number of analyzed items, with a moderate sample size. The absolute value of the standardized load system is greater than 0.6 and significant, indicating a good measurement relationship between the latent and dominant variables. The AVE values corresponding to all the 4 factors are greater than 0.5, and all the CR values are higher than 0.7, which means that the data has good aggregation (convergence) validity. The AVE square root values of the four factors are greater than the absolute inter-factor correlation coefficient values, implying good discriminatory validity.

4.3. Hypothesis Test

The first-order model composed of H2, H3 and H4 is fitted. The common indicators are within the judgment criteria, indicating that the overall fit degree of the first-order model is within the acceptable range ($\chi^2/df=1.511<3$, $GFI=0.942>0.9$, $RMSEA=0.050<0.10$, $RMR=0.011<0.05$, $CFI=0.991>0.9$, $NFI=0.973>0.9$, $AGFI=0.911>0.9$). As can be seen from Table 3, the three dimensions of logistics service quality of cross-border e-commerce all have a significant positive impact on satisfaction, that is, H2, H3 and H4 are all established. According to the degree of influence, supply chain service, basic service and value-added service are in descending order, with the path coefficients of 0.390, 0.370 and 0.228, respectively.

The second-order model composed of H1, H2, H3 and H4 is fitted. The common indicators are within the judgment criteria, indicating that the overall fit degree of the

second-order model is within the acceptable range ($\chi^2/df=1.554<3$, $GFI=0.938>0.9$, $RMSEA=0.052<0.10$, $RMR=0.013<0.05$, $CFI=0.990>0.9$, $NFI=0.972>0.9$, $AGFI=0.908>0.9$). The second order path coefficient is shown in Table 4, which can be seen that logistics service quality has a significant positive impact on satisfaction, and the path coefficient is 0.951, that is, H1 is established.

Table 2. Descriptive statistical analysis

Name	Option	Frequency □	Percentage (%)□
Sex	Man	77	37.75
	Woman	127	62.25
Age	Under 30	63	30.89
	30-39 Years old	67	32.84
	Age 40 and over	74	36.27
Occupation	Student	33	16.18
	Civil servants and employees of public institutions	59	28.92
	Enterprise worker	72	35.29
	Freelancer or otherwise	40	19.61
Family annual income	Less than 30,000	21	10.29
	30,000-80,000	46	22.55
	80,000-300,000	67	32.84
	More than 300,000	70	34.31
More preferred cross-border e-commerce companies	Tmall International	104	50.98
	JD International	77	37.75
	Other	23	11.27
More preferred import logistics mode	Overseas direct shipping	41	20.10
	Overseas warehouse delivery	13	6.37
	Bonded warehouse delivery	81	39.71
	Domestic delivery	26	12.75
	Don't care where the goods are shipped from	43	21.08
Amount to		204	100.0

4.4. Variance Test

In order to further verify the practicability of the model, the questionnaires of Tmall International and JD International are selected from the valid questionnaires, and the logistics service satisfaction of the two cross-border e-commerce companies is compared by variance analysis. Although the average value of basic service quality, value-added service quality, supply chain service quality and customer satisfaction of JD International are all higher than that of Tmall International, they are not significant, so there is no significant difference between the logistics service satisfaction of the two cross-border

e-commerce companies.

Under the two e-commerce companies, customers prefer to deliver goods from bonded warehouses or domestic warehouses, and the average value of logistics service satisfaction is also higher. In Tmall International, the value-added service quality of different import logistics modes shows significant differences; in JD International, the basic service quality of different import logistics modes shows significant differences. For the two cross-border e-commerce companies, there is no significant difference in the supply chain service under different import logistics modes.

Table 3. First-order path coefficients

Path relationship			Non-standardized regression coefficients	SE	z	p	Standardized regression coefficient
H2: Basic service	→	Customers satisfaction	0.352	0.073	4.804	0.000	0.370
H3: Value-added service	→	Customers satisfaction	0.206	0.065	3.184	0.001	0.228
H4: Supply chain service	→	Customers satisfaction	0.360	0.060	5.956	0.000	0.390

Table 4. Second-order path coefficients

Path relationship			Non-standardized regression coefficients	SE	z	p	Standardized regression coefficient
Logistics service quality	→	Basic service	1.000	-	-	-	0.914
Logistics service quality	→	Value added service	1.013	0.072	14.058	0.000	0.876
Logistics service quality	→	Supply chain service	0.987	0.071	13.913	0.000	0.873
H1: Logistics service quality	→	Customers satisfaction	0.993	0.059	16.792	0.000	0.951

5. Conclusions and Revelation

Existing literature were mostly based on SERVQUAL and LSQ model to study the influencing factors of cross-border logistics service quality. This paper has innovatively used three dimensions of the basic service, value-added service and supply chain service based on KANO and LSQ model to establish the cross-border logistics service quality satisfaction equation model and studied the influence of different logistics import modes on satisfaction. The following conclusions are drawn from the empirical study:

1) The three dimensions of logistics service quality of cross-border e-commerce all have a significant positive impact on satisfaction, among which supply chain service has the greatest impact, followed by basic service and value-added service. Cross-border e-

commerce companies should constantly optimize their cross-border supply chain, improve the global supply capacity, increase the variety of goods, and quickly get new, and truly realize global sales. In addition to supply chain service, customers are very concerned about the basic service of complete and correct delivery of goods, followed by value-added service with faster logistics information update, faster delivery, and faster return goods. Cross-border e-commerce should first complete cross-border logistics with both quality and quantity guaranteed, and then complete it faster.

2) In general, customers are satisfied with various import logistics modes, and the satisfaction evaluation is above 3.5 points. Since the bonded warehouse mode has been implemented for many years, customers more accept and love it, and the satisfaction of logistics service under this mode is also higher. In recent years, the enterprise has just adopted the overseas warehouse mode. In contrast, customers have less understanding of the overseas warehouse mode, and their satisfaction is also low. For Tmall International, there are significant differences in value-added service under different import logistics modes, so the responsiveness of cross-border logistics service should be strengthened. For JD International, there are significant differences in basic service under different import logistics modes, so the reliability of cross-border logistics service should be strengthened. It is worth noting that there is no significant difference in the supply chain service under different import logistics modes. The quality of supply chain service delivered from overseas or overseas warehouses should be better because they can provide personalized purchasing and delivery service to customers; the non-significant difference result may be due to the limitation of sample data and the randomness of sample survey.

In future studies, questionnaires should combine online and offline to increase face-to-face communication with customers and improve the scientificity of the scale; and expand the scope of sample collection to make more samples for each option to obtain more representative data. In addition, the credibility of e-commerce companies and the government can be taken as the intermediary in the model.

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