An Evaluation Method of Logistics Product Service Quality Integrating User Experience and Enterprise Internal Factors

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Abstract- This paper proposes a multi-level logistics product service quality evaluation system combining user experience and internal factors of logistics enterprises. The integration of logistics process factors and internal factors of logistics enterprises into the assessment criteria at the same time has changed the idea that the previous models made subjective decisions only based on users' own experience and logical cognition, and provided new ideas for promoting the integration of logistics resources and improving the quality of logistics products and services.

Keywords-Logistics products; Service quality; Entropy weight method; Resource integration

1 Introduction

In logistics, the logistics product itself and the logistics service above the product are the core of everyone's attention. At present, the research on logistics service evaluation mainly focuses on the user's evaluation of the distribution quality of logistics enterprises and the service quality of distribution personnel, including the evaluation of the logistics service level of e-commerce industry [1], the evaluation of the service quality of self-supporting logistics [2] Rural e-commerce terminal distribution quality evaluation [3] and Research on third-party logistics service quality [4].

However, the disadvantages of long logistics industry chain, low resource utilization and non-standard service description are also gradually revealed [5]. Compared with other studies on logistics, the research on logistics service evaluation system is relatively backward. In the past, the service quality of logistics products was mostly subjective decisions made from the standpoint of users and based on users' own perception and logical cognition. However, the evaluation of logistics service quality should not only rely on the Perspective of users, the cost Efficiency is also one of the important indicators to assess the quality of logistics service.

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2 Research status of logistics service quality

Gronroos [6], a Finnish scholar, believes that the concept and model of marketing must develop in the direction of more similar services, and the service quality should include technology and function quality. Morgan and hunt [7] believe that effective commitment is conducive to the improvement of customer loyalty in the process of logistics service. In 2009, Chen Mingliang [8] and others constructed a logistics service quality evaluation system with 4 dimensions and 12 indicators according to the characteristics of the cigarette industry. In 2011, Ye Zuoliang [9] and others proposed the " LSQ − CS " model based on customer satisfaction. In the same year, Xie Peihong [10] and others said that the distribution capacity of logistics enterprises greatly affected customers' satisfaction with logistics services. In 2012, He Yaoyu [11] and others first incorporated information and matching ability into the standard assessment of customer satisfaction, and put forward a strategy to effectively improve customer satisfaction through hypothesis method. Xu Ying [12] and others put forward the "logistics service quality customer loyalty" model, and proved that logistics service quality directly and positively affects customer loyalty by using fitting analysis, path analysis and reliability and validity test. In 2018, Qi Yan [13] pointed out that the factors affecting customer satisfaction can be calculated based on mathematical statistical methods, providing a new idea for the research of logistics service quality. In 2021, Du Jinsheng [14] and others clearly pointed out that good logistics service quality greatly improves customer loyalty based on SERVOUQUAL model and LSQ evaluation model of logistics service quality.

3 Multilevel logistics service evaluation model

Since most of the traditional logistics product service quality evaluation models are subjective decisions made from the standpoint of users and based on users' own perception and logical cognition, and have certain limitations, this paper proposes a reasonable and effective logistics product service quality evaluation model combined with user experience and internal factors of logistics enterprises, which is applied in the actual logistics service process, To improve logistics service quality and customer satisfaction.

3.1 Implementation scheme

3.1.1 Design of evaluation index system

Based on the different current service evaluation standards of different service subjects, priority shall be given to the problems most concerned by users and most concentrated complaints in the process of logistics distribution, taking into account the principles of criticality, representativeness, objectivity and operability, according to the principles of pre service (delivery), in service (distribution) After service (after-sales and reverse logistics service) three logistics service sequences, extract the most concerned core indicators in the three links, combined with logistics service cost, internal coordination quality and information interaction ability of logistics enterprises, and finally form a logistics service quality evaluation system for users and logistics enterprises at the same time.

3.1.2 Data acquisition

The questionnaire is designed according to the evaluation indicators. The questionnaire mainly includes 7 dimensions and 20 indicators in total. Since this model mainly involves two levels: users and logistics enterprises, 36.84% of the respondents in this questionnaire are engaged in or have been engaged in logistics related occupations, and 42.1% have received logistics related education. The collected data can comprehensively cover the two levels of the model. In addition, 71.93% of the respondents received logistics services more than 5 times a month, indicating that the respondents had full experience of logistics services, which further improved the reliability of the questionnaire. The two-level indicators contained in the questionnaire constructed in this paper are shown in Table 1. A, B, C and D in the first level indicators mainly involve the logistics service process, e, F and G indicators are the internal factors of logistics enterprises, and the second level indicators are the refinement of the first level indicators.

3.1.3 Entropy weight method to determine weight

According to the questionnaire results, the weight of secondary indicators is calculated according to the entropy weight method. When m indicators are given, the data are de dimensioned through the min max deviation standardization formula, and the calculation function is shown in formula (1):

$$Y_i = \frac{X_i - \min(X_i)}{\max(X_i) - \min(X_i)} \tag{1}$$

Formula (2) is used to calculate the proportion of each indicator in this dimension:

$$\mathrm{P_i} = \frac{\mathrm{Y_i}}{\sum_{\mathrm{i=1}}^{\mathrm{n}} \mathrm{Y_i}}, \mathrm{i} = 1,2,3 \tag{2}$$

As shown in formula (3), the information entropy of the index is calculated by combining the results of formula (1) and formula (2):

$$\mathrm{E_i} = -\ln(\mathrm{n})^{-1} * \mathrm{P_i} * \ln \mathrm{p_i} \tag{3}$$

The index weight is calculated by combining the information entropy, and its function is shown in formula (4):

$$\mathrm{W_i} = \frac{1 - \mathrm{E_i}}{\mathrm{M} - \sum \mathrm{E_i}} (\mathrm{i} = 1,2,3) \tag{4}$$

In order to better avoid the deviation of experimental results caused by human factors, the entropy weight method calculates the variation degree of different indicators through information entropy, so as to measure the weight of the indicator, which makes the entropy weight method often ignore the importance of the indicator itself. Therefore, in order to balance

the disadvantages brought by the entropy weight method, when calculating a level-1 indicator, the weight is calculated according to the importance of the indicator itself and its proportion in all level-1 indicators. The level-1 indicator $X=\{X_1,X_2,X_3,X_4,\ldots\ldots,X_n\}$, n = 7 and the weight is N. The specific formula is shown in formula (5):

$$N_j = \frac{X_j}{\sum_{j=1}^{n} X_j} \tag{5}$$

Finally, a logistics service quality evaluation system for both users and logistics enterprises will be formed:

Table 1 multi level indicators and indicator weights

Serial number	Primary indicator (dimension)	Primary index weight	Secondary index	Secondary index weight
A	*Storage quality of articles*	0.148	*A1: integrity of goods*	0.48
			A2: accuracy rate of goods quantity (whether there are lost or less pieces)	0.52
B	*Logistics distribution quality*	0.151	*B1: is the pick-up time free*	0.28
			B2: complexity of picking up process	0.40
			B3: accuracy of parcel delivery and pick-up information	0.32
C	*Service quality of terminal staff*	0.144	*C1: service attitude*	0.29
			C2: staff quality	0.30
			C3: door to door service	0.41
D	*Emergency treatment quality*	0.148	*D1: time for handling exceptions*	0.31
			D2: is the delivery of special festivals delayed	0.41
			D3: is the compensation clause clear	0.28
E	*Cost of logistics services*	0.130	*E1: distribution network coverage*	0.34
			E2: advanced level of enterprise technology and equipment	0.28
			E3: facilities and environment of outlets	0.38
F	*Internal coordination quality of logistics enterprises*	0.138	*F1: management execution quality*	0.31
			F2: degree of teamwork	0.28
			F3: reasonable setting of functional departments	0.41
G	*Logistics information interaction quality*	0.141	*G1: is online processing supported*	0.33
			G2: smooth complaint channels	0.33
			G3: information confidentiality	0.34

3.2 Performance evaluation

3.2.1 Model performance evaluation

The fuzzy comprehensive evaluation method is used to evaluate the effectiveness of the model proposed in this paper. Firstly, the index set U=（u_1,u_2,u_3,u_4,u_5,u_6,u_7） is established, and its elements are the primary indicators affecting logistics service quality, that is, A, B, C, D, E, F, G, H in Table 1. Then, a comprehensive evaluation set V={v_1,v_2,v_3,v_4,v_5} is established, in which V_1, V_2, V_3, V_4 and V_5 respectively represent "not good", "general", " preferably ", "good" and "very good". Thus, the single factor evaluation matrix R is obtained, as shown in formula (6):

$$R=\begin{bmatrix} 0 & 0.0172 & 0.1379 & 0.1552 & 0.6897 \\ 0 & 0 & 0.1207 & 0.1552 & 0.7241 \\ 0.0172 & 0.0172 & 0.1379 & 0.1724 & 0.6552 \\ 0.0517 & 0.0517 & 0.2586 & 0.1552 & 0.4828 \\ 0.0345 & 0.0172 & 0.1724 & 0.2414 & 0.5345 \\ 0.0345 & 0 & 0.1379 & 0.2586 & 0.569 \\ 0 & 0 & 0.1552 & 0.1379 & 0.7069 \end{bmatrix} \quad (6)$$

The weight calculation function of the primary index is shown in formula (7):

$$N = (0.137 \quad 0.136 \quad 0.140 \quad 0.161 \quad 0.146 \quad 0.142 \quad 0.137) \quad (7)$$

R is the single factor evaluation matrix and N is the factor weight vector. After determining the two variables R and N, carry out fuzzy transformation to realize the transformation of U (n) -> V (b) (that is, realize the transformation from fuzzy vector n on u to fuzzy vector B on V), the calculation formula of fuzzy vector B is shown in formula (8).

$$B = N * R \quad (8)$$

The obtained fuzzy vector is calculated, and the result is shown in formula (9):

$$B = (\ 0.00943 \quad 0.00236 \quad 0.06410 \quad 0.08759 \quad 0.24950\ ) \quad (9)$$

The performance evaluation level based on fuzzy vector B accounts for, for example, as shown in Figure 1, in which the proportion of comprehensive evaluation as "very good" is as high as 62%, and the proportion of comprehensive evaluation as "bad" and "general" is only 2%. The proportion of positive evaluation (including "good" and "very good") exceeds 90%, indicating that the evaluation model of logistics product service quality considering user feelings and logistics enterprises has a high praise rate.

In order to intuitively display the system evaluation score and finally determine the score of the logistics service evaluation system, grade the comprehensive evaluation set v, Its value is shown in formula (10):

$$S = (20 \quad 40 \quad 60 \quad 80 \quad 100) \tag{10}$$

The scoring formula is shown in (11):

$$F = B_{1*n} * S_{1*n}^{T} \tag{11}$$

The final service quality score of the model is 87.26. Compared with the logistics service quality evaluation model based on user experience only, The fuzzy vector B1 is shown in formula (12):

$$B1 = (\ 0.029598 \quad 0.03486 \quad 0.170618 \quad 0.159217 \quad 0.605697) \tag{12}$$

For example, as shown in Figure 1, in the logistics service quality evaluation model based on user experience only, the proportion of "bad", "general" and " preferably " is higher than that of the multi-level model, while the proportion of "good" and "very good" is significantly lower. The comprehensive score is 85.53, which is lower than the multi-level logistics service evaluation model proposed in this paper.

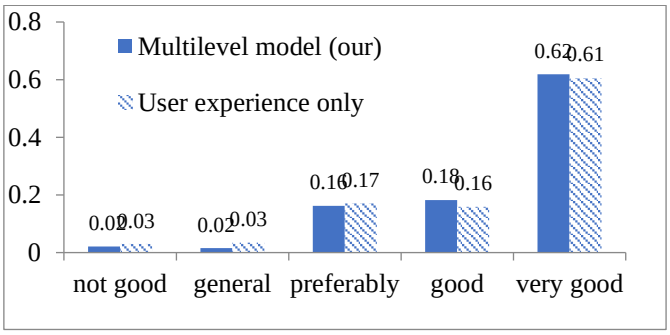

Fig. 1 Comparison of evaluation level between multi-level model and model based on user experience only

According to figure 1 and the comprehensive scores of the two models, the comprehensive score of the multi-level logistics product service quality evaluation model combined with user experience and logistics enterprises is high, and the performance and feasibility of the system are high. From Figure 1 and the comprehensive scores of the two models, it can be seen that the multi-level logistics product service quality evaluation model combined with the user's feeling and the logistics enterprise comprehensively considers the logistics service process, the user's personal feeling and the internal factors of the logistics enterprise when facing different subjects in the logistics service process, comprehensively covers different subjects in the logistics service process, and takes into account the key The principles of representativeness, objectivity and operability, and the comprehensive score is high, and the performance and feasibility of the system are high. It helps to solve the problems of long logistics industry chain, low resource

utilization, high cost, fragmented end services, non intensive, multi-agent, non-standard service description and low sharing efficiency in the logistics industry.

4 Conclusion

In recent years, the rise of e-commerce industry has largely promoted the development of the logistics industry. The participation of customers in the whole logistics process is higher and higher, which also makes customers have higher and higher requirements for logistics service quality. Although the existing logistics service quality evaluation model can better evaluate the logistics service quality, However, they often focus on the subjective feelings of users and ignore the impact of internal factors of logistics enterprises on logistics service quality. The logistics service quality evaluation system for both users and logistics enterprises proposed in this paper is based on the complete logistics process and the internal needs of logistics enterprises. At the same time, the user experience and internal factors of logistics enterprises are included in the logistics service evaluation index to evaluate the logistics service quality more comprehensively and promote the integration of logistics resources, Provide new ideas for improving logistics service quality.

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