Performance evaluation of Masteel's logistics shipping service based on AHP-fuzzy comprehensive evaluation method

Qilin Zhang, Xiaoyong Zuo, Guozhen Tong, Xintong Liu, Siyu Chen

Century College, Beijing University of Posts and Telecommunications, Beijing, 102101

Abstract: The main purpose of this paper is to evaluate the service quality of China United Shipping Logistics of Maanshan Iron and steel company. Based on the relevant theoretical evaluation model and the actual situation of China United Shipping Company of Maanshan Iron and Steel Co., Ltd., the specific dimension index is established to realize the combination of qualitative analysis and quantitative analysis. We mainly use AHP to calculate the weight after obtaining the evaluation index through online survey, network data survey and enterprise internal personnel consulting survey. Finally, we use fuzzy comprehensive evaluation method to evaluate the service level data of this enterprise and draw a conclusion.

1. Introduction

With the rapid development of economy, China's logistics industry has entered a stage of rapid development. Therefore, in recent years, the optimization of service quality of logistics industry has been widely concerned. This paper takes the maritime logistics of China United Shipping Co., Ltd. of Maanshan Iron and Steel Co., Ltd. as the background, and hopes to explore the development of customer service of maritime logistics enterprises through the research on the performance evaluation of enterprise maritime logistics, so as to better improve the service ability of maritime logistics, improve the efficiency of maritime logistics distribution and improve the service quality.

2. Construction of Service Performance Evaluation Index System

2.1 Delphi Method to Determine the Evaluation Index System

(1) First round screening

After analyzing the structure and composition of Zhonglian shipping company of Maanshan Iron and Steel Co., Ltd., this paper summarizes and reads the evaluation indexes of relevant literature on maritime logistics performance evaluation, and establishes three secondary indexes and 19 tertiary indexes [1]. But the performance evaluation index can not only consider the comprehensiveness, but also the representativeness and typicality [2]. Therefore, this paper uses the Delphi method to determine the final index of customer satisfaction evaluation of Ma'anshan Zhonglian Shipping Co., Ltd.

(2) Second round screening

1) In this paper, we take the delivery function index as an example, the steps are as follows: collect 10 experts to evaluate the importance of the delivery function index scoring results;

2) In the same way, we collect the scores of other indicators and calculate their mean and standard deviation;

3) Determine the evaluation index system. After three rounds of expert consultation and feedback, 18 indicators were selected from 22 initial indicators as the performance evaluation indicators of customer satisfaction of Ma'anshan Zoomlion Shipping Co., Ltd. As shown in Table 1.

Table 1: Evaluation index system of customer satisfaction

Target	Secondary Indicators	Third Level Indicators
Performance evaluation of logistics shipping service in Masteel	Storage index A_1	Accuracy of purchase and delivery B_1
		Utilization rate of storage area B_2
		Cargo quantity accuracy B_3
		Arrival advance rate B_4
		Transport time B_5
	Scale index of shipping port facilities A_2	Container throughput B_6
		Cargo throughput B_7
		Number of berths B_8
		Wharf length B_9
		Equipment time utilization B_{10}
	Informatization level index A_3	Realization rate of supply plan B_{11}
		Order integrity B_{12}
		Order processing time B_{13}
		Information update frequency B_{14}
		Order accuracy B_{15}

2.2 Qualitative and Quantitative Methods of Index Calculation Method

(1) Qualitative index calculation method

According to the qualitative evaluation index, it can be divided into four scoring areas: excellent value (80% - 100%), good value (50% - 79%), general value (20% - 49%), weak value (0% - 19%), and selecting appropriate score value in the corresponding region.

(2) Calculation method of quantitative index

For quantitative indicators, the specific score of the indicator is converted into the same year according to the specific ratio of business indicators.

3. Establishment of Performance Evaluation Model

3.1 AHP Determination of Weight

The weight calculation of criterion layer, storage index and information level index is carried out respectively. The calculation steps are as follows.

Step 1: Building the initial matrix.

Step 2: Calculate the weight. The relative weight vector of the criterion layer can be calculated according to the following formula.

$$W_i = (\prod_{j=1}^{n} a_{ij})^{\frac{1}{n}} \tag{1}$$

$$\overline{W}_i = \frac{w_i}{\sum i w_i} \tag{2}$$

Step 3: Get the maximum eigenvalue.

Step 4: Carry out the consistency test according to the following formula, and pass the consistency test if CR < 0.1.

$$CI = \frac{\lambda_{max} - n}{n-1} \tag{3}$$

$$CR = \frac{CI}{RI} \tag{4}$$

3.2 Fuzzy Evaluation Method to Determine the Shipping Service Quality

In this paper, the fuzzy comprehensive evaluation method is used to construct the fuzzy evaluation matrix to comprehensively evaluate the service quality [3]. The specific steps are as follows:

Step 1: establish the factor subset of virtual logistics service quality evaluation. The evaluation factor set is composed of the factors that affect the service quality of avatar logistics, the factor set u is composed of the second index, and the sub factor set UI is composed of the third index. Factor set u = {logistics operation index, shipping port facilities scale index, informatization level index}, sub factor set U1 = {purchase and delivery accuracy index, storage area utilization rate index, cargo quantity accuracy index, arrival advance rate index, transportation time index}, U2 = {container throughput index, cargo throughput index, berth quantity index, terminal length index Equipment time utilization index}, U3 = {supply plan realization rate index, order integrity index, order processing time index, information update frequency index, order accuracy index}.

Step 2: build evaluation set. The comment set is a group of terms to evaluate the service quality of China United Shipping Logistics of Maanshan Iron and Steel Co., Ltd. the comments in the comment set are qualitative descriptions of the evaluation objects. In this paper, the evaluation is divided into five levels: v = {V1, V2, V3, V4, V5} = {excellent, good, medium, poor, very poor}, and the evaluation set is given to quantify the scoring interval, so as to get the quantitative evaluation results.

Step 3: establish the evaluation matrix R. Membership degree refers to the ratio of the number of people whose evaluation of an indicator is a certain comment to the total number of people in the evaluation results of multiple people. Generally, R is used to express the membership degree matrix.

$$R_i = (R_{i1}, R_{i2}, R_{i3}, ... R_{ij})(i, j = 1,2,3...n) \tag{5}$$

c_{ij} refers to the number of people who agree with the i factor as the j judgment. Easy to get:

$$ri_j = \frac{c_{ij}}{\sum\limits_{j=1}^{i} c_{ij}}(i = 1,2,...n) \tag{6}$$

Step 4: determine the factor weight vector. The weight of the influencing factor is a fuzzy vector on u, W=[a1,a2, …, ap], where ai is the weight of the ith factor, and the sum of the weights is 1.

Step 5: the comprehensive evaluation model $S = W \times R$ is established. According to the evaluation matrix R and factor weight vector w, the fuzzy vector a on u is changed into fuzzy vector

B on V by fuzzy change.

Step 6: determine the total score of the system and analyze it.

From the above evaluation, the logistics service provided by China United Shipping Logistics Co., Ltd. of Maanshan Iron and Steel Co., Ltd. has both good and unreasonable aspects, and the areas to be improved are as follows:

(1) From the perspective of storage index, Ma'anshan Iron and steel Zhonglian shipping logistics company has good control ability of storage index on the whole. Among the secondary indicators, the indicators of arrival advance rate and transportation time need to be improved. In order to better improve the service quality, the company should comprehensively improve the training of service personnel, clarify the management rules and regulations, and also have a certain forecast in advance for the weather and other factors, so as to minimize the delay of transportation time.

(2) From the perspective of the scale index of shipping port facilities, the index of the number of berths has the highest score, hoping to continue to maintain. The lowest score of container throughput index, can strengthen the number of containers and so on. In the process of investigation, we also found that the cargo throughput will be limited, so we need to find a third-party marine logistics company to assist the unified transportation, which also leads to the increase of cost. From the perspective of long-term development, we need to make further improvements in this area, which can reduce costs and ensure better development.

(3) From the perspective of information level indicators, the biggest problem is that the frequency of information update is not timely. It is suggested that the company formulate corresponding system regulations to improve these problems, clarify the content of logistics information update, and regularly evaluate the operation ability of the information system.

4. Summary

Starting from the marine logistics service of iron and steel enterprises, this paper constructs the evaluation index system of marine logistics service of iron and steel enterprises. After using accurate customer data and internal staff information, we can get the score of the index more accurately, so as to innovate and reform according to the score of the index.

The limitation of this paper lies in the failure to collect all the information of internal personnel of Maanshan Iron and Steel Group Co., Ltd. In the future, more in-depth research and evaluation can be conducted for a company and according to the specific development status, we can constantly improve the index system, enrich the evaluation methods in the model, so that it can better solve practical problems, so as to better provide customers with high quality and efficient logistics service quality.

References

[1] PringerV. Performanceindicatorsinlogistics [J]. JournalofBusinessLogistics, 1990,(10): 25

[2] ThomasA.F.Logisticsbenchmarking: searchingforthebest [J]. Distribution, 1992, 91(3): 30-36

[3] C.Junmo.2009.A Comprehensive Evaluation of Potential value of suppliers, cooperation under green chain based on rough set [J]. The 5thinternational conference on innovation and management, 35: 1248-1253.